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REPORT

1 OF 2

CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT



20 November 1959

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the countries of origin, and is disseminated as an aid to research in the United States.

SCIENTIFIC INFORMATION REPORT

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NOTE: Items in this report are numbered consecutively.

I. BIOLOGY

1. Mechanism of the Effect of Ionizing Radiation on Individual Development

"Data on the Characteristics of the Effect of Ionizing Radiation on Individual Development," by Yu. M. Olenov, K. F. Galkovskaya, and A. D. Pushnitsyna, Institute of Cytology Academy of Sciences USSR, Leningrad; Moscow, Tsitologiya, Vol 1, No 3, May/Jun 59, pp 293-305

The purpose of this report was to present certain data from research on the mechanism of the effect of ionizing radiation on individual development.

The effects of irradiating larvae and pupae of *Drosophila melanogaster* by 1000-6000r X-ray doses are discussed extensively. Conclusions based on the results of these experiments are as follows:

CPYRGHT

"1. X-irradiation of the larva and of the pupa causes the destruction of a part of the cells of imaginal buds -- rudiments of fully developed organs of the insect. 'Roentgenomorphoses' are the result of the incomplete reparation of this injury. Their frequency depends on the period of reparation.

"2. The data that have been obtained make it possible to present a new interpretation for understanding the 'sensitivity period' of ontogenesis. The sensitivity period of a given trait for a given external effect, often, is that stage at which the process of reparation caused by the injury inflicted coincides with the period of the determination of the trait.

"3. The destruction of a part of the undifferentiated cells and the variations caused by them and the course of ontogenesis later on are evidently a general characteristic of the effect of ionizing radiation on a growing organism. This characteristic should be kept in mind during the development of the theory of the biological effect of ionizing radiation."

2. Comparative Effect of Different Types of Ionizing Radiations on Paramecium

"The Effect of Various Types of Ionizing Radiations on Paramecium caudatum," by G. K. Ochinskaya, Department of Experimental Morphology, Central Scientific Research Institute of Medical Radiology, Ministry of Health USSR, Leningrad; Moscow, Tsitologiya, Vol 1, No 4, Jul/Aug 59, pp 393-402

This research is a comparative study of the effect of various types of ionizing radiations on Paramecium caudatum. Six graphs and six tables explain the experimental results.

The author presents the following conclusions:

CPYRGHT

"1. After comparing the effect of alpha-, beta-, gamma-, and roentgen rays on the survival of Paramecium caudatum, sharp differences are detected in the sensitivity of the latter to the various types of radiation. The most injurious effect, determined by the survival index of the Infusoria, is exerted by alpha-rays, then by beta-rays, and then by roentgen rays. The weakest effect is exerted by gamma-rays, the lethal dose of which is ten times that of alpha-rays.

"2. The use of certain criteria for studying the effect of radiation on Infusoria and also the tracing of their reaction to irradiation at the time make it possible to explain certain qualitative, besides quantitative, characteristics of the effect of various types of radiation.

"3. The differences which were detected in connection with the characteristics of the object cannot be explained by the difference in the penetrating capacity of the rays used and evidently are connected with the different ionization thickness caused by them."

3. Protective and Therapeutic Effects of Cysteine Against Cytological Injury Caused by the Gamma-Irradiation of Peas

"The Effect of Cysteine on the Cytological Injuries Caused by Gamma-Irradiation of Peas," by N. V. Luchnik and L. S. Tsarapkin, Biophysics Laboratory of Ural Affiliate Academy of Sciences USSR, Sverdlovsk; Moscow, Tsitologiya, Vol 1, No 1, Jan/Feb 59, pp 71-77

The authors review literature on the controversial subject of the protective effect of cysteine used shortly before and after irradiation. The research described was conducted on pea plants irradiated by gamma-rays from Co⁶⁰ in doses ranging from 10,000 to 15,000 r. Three tables and two diagrams show the effect of cysteine on the rate of cell division and on the number of chromosome aberrations after irradiation.

CPYRGHT

"Results prove that cysteine can, under definite conditions, exert, not only a 'protective' (in the narrow sense of the word), but also a 'therapeutic' effect on irradiated organisms. Since this effect does not lie within the framework of the current radiation-chemical hypothesis of the biological effect of irradiation, it is necessary to reconsider the problem of the role of the products of the radiolysis of water in the biological effect of irradiation and of the mechanism of the anti-radiation effect of the sulfhydryl compounds."

II. CHEMISTRY

Biochemistry

4. Seven-Year Plan for Trends in Soviet Biochemistry Outlined

"Plans for the Development of Biochemistry in the Light of the Resolutions of the 21st Congress of the CPSU" (unsigned article); Moscow, Biokhimiya, Vol 24, No 3, May/Jun 59, pp 385-391

This article presents a general outline of the projects for the development of Soviet biochemistry in the light of those broad plans and major tasks which are connected with the realization of the Seven-Year Plan for the growth of the Soviet national economy.

Three major traits characterize this endeavor:

- (1) The study of phenomena in their dynamic states;
- (2) The attempt to find the connection between the manifestation of functional activity by living bodies and the biochemical processes at its basis;
- (3) The application of the achievements of biochemistry in medicine, agriculture, and in industries which process raw materials of biological origin.

The Seven-Year Plan Specifies the construction of scientific towns where seven scientific research institutes will be created; these institutes will be either directly or indirectly engaged in developing and resolving problems in the fields of biochemistry and allied disciplines. In particular, the following institutes will be constructed: institutes of biochemistry of live cells, of proteins and viruses, of biophysics and radiobiology, of photosynthesis, of chemistry of natural compounds, and others.

It is easy to understand that the organization of these institutes, the construction of which will start in 1962, cannot exert any serious influence on the development of Soviet science in the next few years. Therefore, it is necessary to take measures to strengthen the existing biochemical scientific research institutes and laboratories; and much already has been accomplished in this direction.

Fuels and Propellants

5. Report on the Combustion of Fuels in an Air Stream

"Important Problems in the Development of Technology" (unsigned item); Moscow, Pravda, Vol 48, NO 273 (15032), 30 Sep 59, p 4

A general conference of the Department of Technical Sciences, Academy of Sciences USSR, was held on 29 September 1959. At this conference, important problems pertaining to the advancement of technology in a number of branches of the national economy were discussed.

Academician N. V. Mel'nikov, Corresponding Member of Academy of Sciences USSR, gave a report on problems involved in open-pit mining. Of great interest was a report by N. N. Shumilovskiy, Doctor of Technical Sciences, and L. V. Mel'ttser, Candidate of Technical Sciences, dealing with the scientific aspects of automatic control methods, utilizing nuclear radiation. A report on the combustion of liquid and solid fuels and also of aqueous emulsions of fuels in an air stream was presented by V. V. Kantorovich, Doctor of Technical Sciences.

Inorganic Chemistry

6. Strength of Bonds in Compounds of Titanium With Silicon and Germanium

"The Interaction Between Atoms in Compounds of Titanium With Silicon and Germanium," by N. V. Ageyev, Yu. M. Golutvin, and V. P. Samsonov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1864-1872

On the basis of the heats of formation, changes in heat capacities with the temperature, and interatomic distances in the crystal lattice, it has been established that the strength of the chemical bonds in titanium-silicon compounds decreases in the order $TiSi \rightarrow Ti_5Si_3 \rightarrow TiSi_2$. In the analogous titanium-germanium compounds, the bond strength was found to decrease in the order $TiGe \rightarrow Ti_5Ge_3 \rightarrow TiGe_2$. As far as titanium-tin compounds are concerned, data are available only on Ti_5Sn_3 and Ti_3Sn ; it was established that the strength of bonds in Ti_5Sn_3 is greater than in Ti_3Sn .

7. Effect of Boron on the Lattice Period of Silicon

"Solubility of Boron in Silicon," by V. A. Epel'baum, M. A. Gurevich, and M. I. Starostina; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1881-1884

The dependence of the lattice period of silicon on the quantity of boron dissolved in the silicon was determined. It is concluded on the basis of the results obtained that a solid solution of the substitution type is formed.

8. Synthesis of Silicon Tetrachloride by the Reaction of Tetrachlorides of Tin, Germanium, and Titanium With a Silicon-Copper Alloy

"Interaction of Tetrachlorides of Tin, Germanium, and Titanium With a Silicon-Copper Alloy," by D. A. Kochkin, M. F. Shostakovskiy, and L. V. Musatova, Institute of Organic Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Prikladnoy Khimii, Vol 32, No 7, Jul 59, pp 1614-1616

It was established that tetrachlorides of elements of the IV group of the periodic system, namely, those of carbon, germanium, and tin, are converted into silicon tetrachloride after being brought into contact with a silicon-copper alloy in the temperature range of 260-500°.

9. Improved Method for the Production of Trichlorosilane and Silicon Tetrachloride

"Interaction of Silicon with Hydrogen Chloride in a Fluidized Solids Layer," by K. A. Andrianov, S. A. Golubtsov, and I. V. Trofimova; Moscow, Zhurnal Prikladnoy Khimii, Vol 32, No 7, Jul 59, pp 1620-1623

A method is proposed for the production of trichlorosilane mixed with silicon tetrachloride by reacting silicon with hydrogen chloride in a fluidized solids layer. By using this method, a considerable improvement of the yield in comparison with published data is obtained. The dependence of the composition of the reaction products on the temperature of the synthesis has been established. The process can be conducted in such a manner that either trichlorosilane or silicon tetrachloride is predominantly formed.

10. Experimental Results Held to Disprove Existence of $Mg_3 B_2$

"The Problem Concerning the Existence of a Magnesium Boride of the Composition $Mg_3 B_2$," by L. Ya. Markovskiy, G. V. Kaputovskaya, and Yu D. Kondrashev, State Institute of Applied Chemistry; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1710-1714

On the basis of the results described, it is concluded that there are no reasons to assume the existence of a boride of the composition corresponding to the formula $Mg_3 B_2$. It has been held since the classical work on boron by H. Moissan that a magnesium boride of this composition exists.

11. Physical Characteristics of Cerium Hydrides

"The Crystal Structure and Density of Cerium Hydrides," by M. Ye. Kost and G. A. Gol'der; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 7, Jul 59, pp 1488-1490

The crystal structure and density of cerium hydrides in the composition range of $Ce H_{0.2}$ - $Ce H_3$ were investigated. Data published in the literature on the presence in the region between Ce and $Ce H_2$ of two phases, namely, one consisting of metallic cerium and another of cerium dihydride, were confirmed. In the region of $Ce H_2$ - $Ce H_3$, there is an insignificant reduction of the lattice period from 5.55 Å for $Ce H_2$ to 5.3 Å for $Ce H_{2.73}$. An exact calculation of the period of the trihydride lattice is difficult because of a considerable broadening of the bands in the Debye X-ray diffraction diagram. The curve of the density of cerium hydride exhibits a minimum in the region of the dihydride. Further adsorption of hydrogen leads to an insignificant increase in density.

12. Zeolite Properties of Ferrocyanides

"The Zeolite Properties of Ferrocyanides," by G. B. Seyfer; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1860-1863

The adsorption of water at $+20^\circ$ by ferrocyanides of divalent metals of the types $M_2 [Fe (CN)_6]$; $Cs_4 M_4 [Fe (CN)_6]_3$; and $Cs_2 M [Fe (CN)_6]$ was investigated. It was found that adsorption of moisture by the ferrocyanides depends on the partial pressure of water vapor in the surrounding space and that this adsorption is reversible.

It was also established that vapors of ethyl alcohol, toluene, and acetone are adsorbed reversibly by ferrocyanides of divalent metals. It is concluded on the basis of the behavior of ferrocyanides of divalent metals that these salts have the properties of zeolites. It is assumed that ferrocyanides of heavy trivalent metals must behave similarly.

[For additional information on inorganic chemistry, see also under Electronics, Materials.]

Insecticides and Herbicides

13. Synthesis of New Herbicides

"Investigations in the Field of Herbicide Synthesis. Report III. γ -Chlorocrotyl Esters of Aliphatic, Aromatic, Mono- and Dicarboxylic Acids," by V. V. Dovlatyan and T. O. Chakryan, Chair of General Chemistry of the Armenian Agricultural Institute; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR-Khimicheskoye Nauki, Vol XII, No 4, 1959, pp 277-281

The γ -chlorocrotyl esters of acetic, butyric, isovaleric, oxalic, succinic, benzoic, and terephthalic acids were prepared and characterized. With the exception of the acetate, this is the first description of these esters in the literature. The synthesis was accomplished by the action of the sodium salts of the acids on 1,3-dichlorobutene-2 in the presence of pyridine as a catalyst.

Research also showed that, as with pyridine, the salts of pyridinium bases and other, aliphatic, amines, as well as ammonia, catalyze the reaction of the formation of γ -chlorocrotyl esters of carboxylic acids.

Isotopes

14. Transfer Equation for Isotope Separation Equipment

"Transfer Equation for Isotope Separation Equipment," by G. Barvikh and R. Ya. Kucherov; Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 275-276

An equation is derived which describes isotope transfer in equipment used for the separation of isotopes. No assumptions are made concerning the method of separation, the design of the equipment, or the nature of hydrodynamic currents, so that the equation can be applied for the calculation of conditions existing in different types of separation equipment. The equation was derived by a method first applied to the investigation of a thermal diffusion column and is based on the assumption that concentration changes in the cross-section of the equipment are small. This assumption is warranted in the majority of cases of isotope separation.

Nuclear Fuels and Reactor Construction Materials

15. Vapor Pressure of Uranium Tetrafluoride

"The Vapor Pressure of Uranium Tetrafluoride," by M. M. Popov (deceased), F. A. Kostylev, and N. V. Zubova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1708-1709

The vapor pressures of UF_4 were measured by the flow method in the temperature range of 875-1000°. Argon purified of oxygen and water vapor was used as the carrier gas.

16. Heat of Formation of UBe_{13}

"Heat of Formation of the UBe_{13} ," by M. I. Ivanov and V. A. Tumbakov; Moscow, Atomnaya Energiya, Vol 7, No 1, Jul 59, pp 33-36

By heating a mixture of beryllium powder and finely dispersed uranium prepared by the decomposition of uranium hydride, a preparation was obtained which consisted principally of UBe_{13} and also contained a small quantity of free beryllium. From the difference of the heats of dissolution of UBe_{13} and a corresponding mixture of the constituents from which this compound is formed, the heat of formation ($-\Delta H^\circ_{298}$) of UBe_{13} was found after the result had been corrected to offset the error due to the presence of impurities. This heat of formation was determined at 339.3 ± 3.8 kilocalories per mol.

17. Extraction of Uranium With the Diisoamyl Ester of Methylphosphinic Acid

"The Properties of Diisoamyl Ester of Methylphosphinic Acid as an Extracting Agent," by V. B. Shevchenko, I. G. Slepchenko, V. S. Shmidt, and E. A. Nenarokomov; Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 236-243

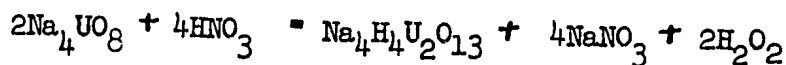
The properties of a new agent for the extraction of uranium, namely, the diisoamyl ester of methylphosphinic acid (DAMPA), are described. It was found that by using this agent, uranyl nitrate is extracted from nitric acid solutions with a considerably higher coefficient of distribution than that obtained with the use of tributylphosphate. Some relationships underlying the extraction of uranyl nitrate and nitric acid by DAMPA dissolved in hydrogenated kerosene were established. It was found that uranyl nitrate is extracted in the form of a coordination compound, the composition of which corresponds to $[\text{UO}_2(\text{NO}_3)_2(\text{DAMPA})_2]$. This association constant of this compound equals 2540 ± 200 . It was also found that nitric acid is extracted in the form of the compound $\text{HNO}_3 \cdot \text{DAMPA}$, the association constant of which equals 0.30 ± 0.03 .

18. Polymerization of Peruranate Anions

"Investigation of the Degree of Polymerization of Some Peruranate Anions in Solution," by A. M. Gurevich and Ye. V. Komarov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1309-1312

It was established that the dissociation of $\text{Na}_4\text{UO}_8 \cdot 9\text{H}_2\text{O}$ in aqueous solutions takes place according to the equation $\text{Na}_4\text{UO}_6 \rightleftharpoons \text{UO}_8^{4-} + 4\text{Na}^+$. It follows from this that the UO_8^{4-} anion is monomeric.

It was furthermore established that the first stage of hydrolysis of the anion in dilute solutions, i.e., the reaction $\text{UO}_8^{4-} + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{UO}_8^{3-} + \text{OH}^-$, is not accompanied by polymerization. It was found that when $\text{Na}_4\text{UO}_8 \cdot 9\text{H}_2\text{O}$ interacts with HNO_3 , the following reaction takes place:



19. Complexes Formed in the System $\text{UO}_2(\text{NO}_3)_2 - \text{KHCO}_3 - \text{H}_2\text{O}_2 - \text{H}_2\text{O}$

"Investigation of the Formation of Complexes in the System $\text{UO}_2(\text{NO}_3)_2 - \text{KHCO}_3 - \text{H}_2\text{O}_2 - \text{H}_2\text{O}$," by Ye. V. Komarov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1313-1323

It was established that in the system $\text{UO}_2(\text{NO}_3)_2 - \text{KHCO}_3 - \text{H}_2\text{O}_2 - \text{H}_2\text{O}$, compounds and ions with a composition corresponding to the formulas $\text{H}_2\text{U}_2\text{O}_9$, $[\text{UO}_2(\text{CO}_3)_3]^{4-}$, and $[\text{UO}_2(\text{CO}_3)_2(\text{OOH})]^{3-}$ are formed, depending on the ratio of the components. The complex ion corresponding to the last of the three formulas listed had not been described in the literature prior to the publication of this work. The reactions which lead to the formation of the compounds and ions mentioned were investigated. The equilibrium constant of the reaction between $[\text{UO}_2(\text{CO}_3)_3]^{4-}$ and hydrogen peroxide was determined. A new method for the determination of stoichiometric reaction coefficients from spectrometric data was applied in the investigation described.

20. Thorium-Zirconium Alloys

"The Constitutional Diagram of the Thorium-Zirconium System", by G. A. Badayeva and G. K. Alekseyenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1873-1880

Quenched samples of thorium-zirconium alloys were subjected to investigation by the determination of microstructure, determination of hardness, and X-ray diffraction analysis. On the basis of the results obtained, a complete constitutional diagram of the thorium-zirconium system was constructed.

21. Tartaric Acid Complexes of Zirconium and Hafnium

"Investigation by the Method of Ion Exchange of the Formation of Complexes by Zirconium and Hafnium With Tartaric Acid," by D. I. Ryabchikov, A. N. Yermakov, V. K. Belyayeva, and I. N. Marov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1814-1826

It has been established that it is possible to apply the method of ion exchange in the investigation of the formation of complexes by multiply-charged cations of the type Me^{4+} that form compounds which have a strong tendency to hydrolyze. A method is proposed for calculating the composition of complex compounds which are formed in strongly acidic solutions. The formation of complexes by Hf^{4+} and Zr^{4+} with tartaric acid in perchloric acid solutions was investigated. The concentrations limits within which complexes of the types

$MeH Tar^{3+}$ and $MeTar^{2+}$ are formed were determined. The constants of the reactions of the formation of these complexes were calculated.

22. Compounds of the Pentachlorides of Niobium and Tantalum With Phosphorus Oxychloride

"Compounds of the Pentachlorides of Niobium and Tantalum With Phosphorus Oxychloride," by I. A. Sheka, E. A. Voytovich, and L. A. Nisel'son, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR, and Moscow Institute of Non-ferrous Metals and Gold imeni M. I. Kalinin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1803-1808

By subjecting to thermal analysis the systems $NbCl_5-POCl_3$ and $TaCl_5-POCl_3$, it was established that the compounds $NbCl_5 \cdot POCl_3$ and $TaCl_5 \cdot POCl_3$ are formed. The melting point of the first compound was found to be 124.5° , and of the second compound, 132.4° . The phase equilibria between liquid and vapor were determined for the systems in question at the pressure of 760 millimeters of mercury. It was established that the products of the interaction of niobium and tantalum pentachlorides with phosphorus oxychloride are azeotropic mixtures of the composition $NbCl_5 : POCl_3 = 1.48 : 1$ and $TaCl_5 : POCl_3 = 1.15 : 1$. It was also found that the compound of tantalum pentachloride with phosphorus oxychloride is thermally more stable than the compound of niobium pentachloride with phosphorus oxychloride. From the data of thermal analysis and Schroeder's equation, it was found that the heats of solution of the compounds $NbCl_5 \cdot POCl_3$ and $TaCl_5 \cdot POCl_3$ in phosphorus oxychloride are close to each other and have a value in the vicinity of 3.3 kilocalories per mol.

23. Crystallization Water of the Sulfates of Rare-Earth Elements of the Cerium Group

"Loss of Crystallization Water by Sulfates of Rare-Earth Elements of the Cerium Group," by L. A. Alekseyenko, A. F. Lemenkova, and V. V. Serebrennikov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1382-1385

Thermographic and thermogravimetric curves for the octahydrates of the sulfates of lanthanum, cerium, praseodymium, neodymium, and samarium were determined in the temperature range of 20-270°. It was established that the temperatures at which the first six molecules of water are removed in all cases, with the exception of cerium sulfate octahydrate, increase as the radius of the complex-forming ion decreases in the sequence La-Sm, i.e., as the ion-dipole interaction increases. The assumption was made that the loss of crystal water by the octahydrates of sulfates of rare-earth elements of the cerium group upon heating is of the zeolite type.

24. Complex Salicylates of Lanthanum

"Complex Lanthanum Salicylates," by Ya. A. Fialkov (deceased) and V. I. Yermolenko, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1369-1376

It was found that the lanthanum salicylate LaSal_3 dissolves in alkaline solutions of sodium salicylate, taking up two equivalents of alkali. Potentiometric titration showed that there are two successive splittings off of hydrogen ions from the molecule of lanthanum salicylate. The two constants of the acid-type dissociation of $[\text{H}_2\text{LaSal}_2 \text{'Sal'}]$ were determined and found to be equal to $3 \cdot 10^{-8}$ and $1 \cdot 10^{-10}$. On the basis of an investigation of the heterogeneous system $\text{La}(\text{OH})_3 - \text{NaSal} - \text{NaOH} - \text{H}_2\text{O}$, it was established that the complex lanthanum salicylates $\text{Na}_2[\text{LaSal}_2 \text{'Sal'}]$ and $\text{Na}[\text{LaSal}_2 \text{''}]$ are formed. Their dissociation constants were determined and found to be equal to 2.7×10^{-17} and 1.5×10^{-17} , respectively. Two new compounds, i.e., $\text{Na}[\text{LaSal} \text{'Sal}_2']$ and $\text{Na}[\text{LaSal}_2 \text{''}]$, were isolated.

25. Alloys of Niobium With Lanthanum and Cerium

"Investigation of Alloys of Niobium With Lanthanum and Cerium, by Ye. M. Savitskiy, V. F. Terekhova, and I. V. Burov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1462-1463

On the basis of experimental data obtained in the work described, the constitutional diagram of niobium-cerium alloys was constructed up to a point corresponding to a cerium content of 50% by weight, and that of niobium - lanthanum alloys, up to a point corresponding to a lanthanum content of 50% by weight.

26. Polyiodides of Rare-Earth Metals

"Dissolution of Iodine in Solutions of Iodides of Rare-Earth Elements", by B. V. Serebrennikov and N. P. Votnova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1428-1436

The solubility of iodine in solutions of iodides of lanthanum and cerium of different concentrations was determined. It was found that the solubility of iodine in solutions of lanthanum and cerium iodides increases with the concentration of iodides because higher polyiodides are formed at greater concentrations. The diagram composition -- optical density of the systems $\text{La I}_3 - \text{I}_2$ and $\text{Ce I}_3 - \text{I}_2$ -- indicates that dilute solutions (approximately 0.001 molar) contain polyiodides of the composition $\text{Me (I}_7)_3$. It was found that the solubility of iodine in solutions of the iodides investigated gradually decreases in the sequence $\text{La I}_3 - \text{Ce I}_3 - \text{Tr I}_3 - \text{Nd I}_3 - \text{Sm I}_3$ because of the increasing polarizing effect exerted by the cation.

27. Complexes Formed by Zirconium Iodide

"Physicochemical Investigation of Interactions Between Zirconium Halides and Esters of Monobasic Acids; Part 5 - Zirconium Iodide Complexes", by O. A. Osipov and Yu. B. Kletnik, Novocherkassk Polytechnic Institute; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2119-2124

The polar properties of complexes formed by zirconium iodide with esters of monobasic carboxylic acids in benzene were investigated. General relationships are derived in regard to the polarity of complexes of this type, and aspects of their behavior are determined by polarity.

28. Economy of Steel in the Construction of Reactors

"Ways of Economizing Steel in Reactor Construction," by A. N. Komarovskiy; Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 205-214.

The principal ways in which steel can be economized in the construction of reactors are discussed in the article. It is shown that in stationary nuclear reactors, the best way of economizing steel is by replacing it with concrete. Data are cited which indicate that the mechanical strength and radiation stability of concrete are not being utilized adequately at present and that the hair cracks which form in the concrete do not affect its protective properties. The problem concerning the use of protective antiexplosion barriers ("shells") is discussed. As an example which demonstrates the advisability from the cost standpoint of applying protective chambers (instead of protective shells) to withstand excessive internal pressure, the project of a USSR boiling water reactor is mentioned.

29. USSR Pumps for Sodium and Sodium-Potassium Alloys

"Designs and Operation of Pumps for Sodium and Sodium-Potassium Alloys," by P. L. Kirillov, V. A. Kuznetsov, N. M. Turchin, and Yu. M. Fedoseyev; Moscow, Atomnaya Energiya, Vol 7, No 1, Jul 59, pp 11-17

This article describes USSR designs of centrifugal and electromagnetic pumps for sodium and sodium-potassium alloys. Information is given on results of tests and experience acquired in the operation of pumps of the types mentioned. The pumps in question have been used in the past 2 years at experimental and pilot plant installations. The behavior of materials exposed to high temperatures and to the action of sodium and potassium is described.

Organic Chemistry

30. Addition of Amines to Vinylacetylene Piperidols

"The Chemistry of Vinylacetylene. Report XVIII. The Addition of Amines to Vinylacetylene Piperidols," by S. A. Vartanyan and Sh. O. Badanyan, Institute of Organic Chemistry, Academy of Sciences Arm SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy—Khimicheskoye Nauk SSR, Vol XII, No 4, 1959, pp 267-272

Upon heating a mixture of an aqueous solution of amines and vinylacetylene piperidols in a metal bomb, addition of amines to the vinylacetylenyl radical takes place, and the corresponding substituted 4-(4'-dimethylamino-2'-butynyl)-4-piperidols are formed.

Dimethylamine adds to the α - and β -forms of 2-methyl-4-vinylethynyl-4-hydroxydecahydroquinoline with the formation of the α - and β -forms of dimethylaminoacetylene 4-hydroxydecahydroquinolines.

The corresponding saturated aminopiperidols were obtained by the hydrogenation of 2,5-dimethyl-4-(4'-dimethylamino-2'-butynyl)-4-piperidol and 1,2,5-trimethyl-4-(4'-dimethylamino-2'-butynyl)-4-piperidol.

31. Effect of Alkoxybenzyl Radicals on the Oxidation of Acetic Acids

The Preparation of 4-alkoxybenzyl- γ -chlorocrotylacetic Acids," by M. T. Danyan and M. G. Zalyan, Chair of Organic Chemistry of the Yerevan State University; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR - Khimicheskoye Nauki, Vol XII, No 4, 1959, pp 273-276

The purpose of the investigation conducted was to study the effect which alkoxybenzyl radicals exert on the oxidation of acetic acids containing them.

Upon interaction of 1,3-dichlorobutene-2 with Na-derivatives of the diethyl esters of 4-alkoxybenzylmalonic acids, six diethyl esters of 4-alkoxybenzyl- γ -chlorocrotylmalonic acids were obtained which had not been described until then.

By the hydrolysis and subsequent decarboxylation of the diethyl esters of 4-alkoxybenzyl- γ -chlorocrotylmalonic acids, five corresponding malonic and six acetic acids, previously unknown, were obtained.

The physical constants of the newly synthesized compounds are listed in three tables.

Organometallic Compounds

32. New Synthesis of Trialkylgermanium Fluorides

"The Synthesis of Trialkylgermanium Fluorides," by B. M. Gladshcheyn, V. V. Rode, and L. Z. Soborovskiy; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2155-2156

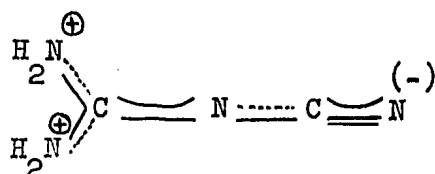
A method has been found for the synthesis of trialkylgermanium fluorides by the action of hydrogen fluoride on tetraalkylgermanes. It was established that tetramethylgermanium can be synthesized with a high yield by an organomagnesium synthesis under conditions which are described.

Physical Chemistry

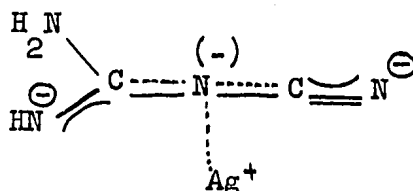
33. Molecular Structure of Cyanamide

"Optical Investigations of the Molecular Structure of Cyanamide and its Derivatives. I. The Molecular Structure of Dicyanamide," B. I. Sukhorukov and A. I. Finkel'shteyn; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 637-641

The investigation of absorption spectra of crystals of dicyanamide, deuterocyanamide, and their silver salts in the infrared region, as well as spectra of combined scattering of dicyanamide solutions, showed that the structure of dicyanamide corresponds to the structural formula



whereas the structure of the silver salt corresponds to the structural formula



34. Energy Transfer in Phosphorescence

"Dependence of the Probability of Energy Transfer in Sensitized Phosphorescence Upon the Oscillator Strength in the Molecule of an Energy Acceptor," by V. L. Yermolayev; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 642-647

(This report was read at the VI Conference on Luminescence in Leningrad, February 1958)

The extinguishing of the radiation of the energy donor at equal concentration of the acceptor in the phenomenon of sensitized phosphorescence does not noticeably vary during transfer from naphthalene to l-chlorine, l-bromine-, and l-iodine naphthalene as acceptors. It follows from the theory of radiationless energy transfer (M.D. Galanin, ZhETF, 21, 126, 114, 1951; Th. Forster, Zs. Elektrochem. 58, 43, 1949; and D. L. Dexter, J. Chem. Phys., 21, 836, 1953) that at the inductive interaction of electromagnetic fields of the molecules participating in the transfer, the amount by which the donor luminescence is extinguished depends strongly on the probability of a radiative transition in the acceptor. Since the extinguishing probability in sensitized phosphorescence does not depend on the oscillator strength of triplet-singlet transitions in the acceptor, the phenomenon of sensitized phosphorescence is evidently caused by exchange-resonance effects and not by the interaction of electromagnetic fields of donor molecules and the energy acceptor.

Radiochemistry

35. Radiolytic Reduction of Americium

"Radiolytic Reduction of Am (VI) and Am (V)," by A. A. Zaytsev, V. N. Kosyakov, A. G. Rykov, Yu. P. Sobolev, and G. N. Yakovlev; Moscow, Atomnaya Energiya, Vol 7, No 1, Jul 59, pp 37-46

The velocity constants of the radiolytic reduction of AmO_2^{2+} in perchloric, sulfuric, and nitric acids were determined on the basis of the radiation yield of reducing products. The values thus found, together with data on the yields of hydrogen peroxide, made it possible to estimate the contribution made by hydrogen radicals to the total reaction of reduction. A mechanism for the radiolytic reduction of AmO_2^{2+} and AmO_2^{+} is proposed. A formula for the velocity of the reduction of AmO_2^{2+} which has been derived makes it possible to calculate the yields of hydrogen peroxide and hydrogen radicals in the solutions subjected to investigation.

36. Fine Structure of the Curve of the Yield of Splinter Elements
Resulting From the Fission of U²³³

"The Fine Structure of the Curve of the Yield of Splinters
of U²³³ Fission," by V. K. Gorshkov and P. M. Anikina; Moscow,
Atomnaya Energiya, Vol 7, No 2, Aug 59, pp 144-147

The yields of Ba¹³⁸, Sr⁸⁸, Sr⁹⁰, and Y⁸⁹ have been determined by means of a mass spectrograph and also the yields of five zirconium isotopes formed as a result of the fission of U²³³. It was established that there is a fine structure of the curve expressing the dependence of the yield of fission splinters on the mass number. An independent determination of the yield of Cs¹³⁶ was made, and the yield of Rb⁸⁶ was estimated independently. On the basis of measurements made in the course of the work described and of data obtained earlier, important sections of the curve expressing the yield of fission splinter elements were plotted. The boundary representing the transition from the emission by light splinter elements of one neutron to the emission of 2 neutrons was determined. The conclusion is made that the structure is correlated with the moment at which the fission event occurred and that the mechanism of the fission of U²³³ gives rise to this structure.

III. EARTH SCIENCES

37. Report on Book on Geodetic Gravimetry

"Problems and Tasks of Geodetic Gravimetry," by M. S. Molodenskiy, Corresponding Member, Academy of Sciences USSR; Moscow, Geodeziya i Kartografiya, No 6, Jun 59, pp 50-56

A report on the book Problemy i zadachi geodezicheskoy gravimetrii (Problems and Tasks of Geodetic Gravimetry) by A. K. Malovichko, written in the Novosibirsk Institute of Engineers of Geodesy, Aerial Surveying, and Cartography, is given by M.S. Molodenskiy. The book was published by Perm State University imeni A. M. Gorkiy in 1958. The book consists of three chapters: (1) Solution of Geodetic Problems by Means of Analytically Extended Anomalies, (2) On the Problem of Studying the Shape of the Earth's Physical Surface, and (3) On the Solution of Several Practical Problems.

Molodenskiy concludes his report thus: "The contents of the book are basically exhaustive, and the conclusion is clear -- concerning geodesy and geodetic gravimetry, the author of the book has a very vague notion. The theoretical level of the book is too low even for a student. It would be interesting to know whether the editor, Prof I. I. Lapkin, himself, read the book."

38. Soviet Geographic Society to Hold Congress in January

"Congress of the Geographic Society To Be Held Soon" (unsigned article); Moscow, Izvestiya, 16 Oct 59, p 6

CPYRGHT

"The Scientific Council of the Geographic Society USSR has discussed the problems related to the forthcoming Third Congress of the Geographic Society USSR, which will be held at the end of January 1960.

"The congress will be held in Kiev. Its participants will discuss reports of the activities of the society during the past 5 years, as well as scientific reports on the most important theoretical, practical, and organizational problems of Soviet geography.

"Elections for president of the Geographic Society and the Scientific Council will be held."

IV. ELECTRONICS

Communications

39. Transistorized Audio-Frequency Dialing Equipment

"Two-Frequency Transistorized Audio-Frequency Dialing Receiver," (unsigned article); Moscow, Vestnik Svyazi, No 9, Sep 59, cover page

The Scientific Research Institute of Electrical Engineering Industry, in cooperation with the Central Scientific Research Institute of the Ministry of Communications has designed a transistorized audio-frequency dialing unit which converts the audio-frequency pulses, transmitted on intercity channels of communications to establish contacts through the aid of automatic or semiautomatic systems, into dc pulses.

40. Telegraph and Telephone Automation in USSR

"Automation of Interurban Telephone and Telegraph -- One of the Most Important Problems of the Seven-Year Plan," by M.N. Stoyanov; Moscow Vestnik Svyazi, No 9, Sep 59, pp 3-4

The article contains the following passages:

"The Central Scientific Research Institute of Communications has begun study of the fundamentals for construction of circuits with contact-free switching elements from ferrites and semiconductors. Utilization of contact-free switching will permit in certain cases reduction of the number of apparatus needed and increased reliability of performance.

"The institute, in conjunction with the State Committee on Radio-Electronics of the Council of Ministers USSR has worked out the technical project for new 16-channel audio-frequency telegraph equipment incorporating semiconductor devices (equipment TT-16-2) and a single-channel equipment (OTT-2) for second-stage multiplexing of telephone channels. It is imperative that the Ministry of Communications USSR secure from industry in 1960-1961 at least the first group of equipment for the TT-16-2 stations."

41. Speedy Erection of Tall Television Towers

"Erection of Television Towers," by G.B. Broverman, Promstal'-konstruktsiya State Design and Planning Institute; Moscow, Novaya Tekhnika Montazhnyky i Spetsial'nykh Rabot v Stroitel'stve, No 5, May 59, pp 6-11

A great number of standard-design television broadcasting towers of the Proektstal'konstruktsiya State Planning and Design Institute will be built in the USSR during the next few years.

These 180-meter-high towers are of lattice-type construction, with a 12-meter-high turnstile antenna mounted on top of the tower. Up to a height of 155 meters the tower has a square cross-section; above this level the tower has a triangular cross-section. The sides of the tower at the base are 20 m and the sides of the triangular section at the base are 1.75 m. The tower is built of steel tubes 80-325 mm in diameter and steel rods up to 42 mm in diameter. A suspended universal crane was designed under the direction of the author which permits the erection of such a tower in a record time of one month. This universal crane lifts itself as the erection of the tower progresses. Since the crane can erect 32 meters of tower from a single position, only six shiftings of the crane are needed during the whole process of tower erection. The one-meter square shaft of the crane with an 11-meter boom is mounted at the center of the tower. The lifting capacity of this erection crane is 2.5 tons at the full length of the boom.

With the aid of such cranes, television broadcasting towers were erected in Zaporozh'ye, Karaganda, Irkutsk, Sochi, Novosibirsk, Alma-Ata, Kemerovo, Odessa, Dnepropetrovsk, L'vov, and Stalingrad.

42. First Soviet Experimental Color-Television Broadcasting Station

"Moscow Experimental Color-Television Broadcasting Station," by I. N. Denisenko; Moscow, Tekhnika Kino i Televideniya, No 8, Aug 59; pp 1-7

Installation of equipment for an experimental color-television broadcasting station in Moscow has been completed. The equipment was designed at the All-Union Scientific Research Institute for Television in cooperation with a number of industrial enterprises.

The color television utilizes the principle of simultaneous transmission of the three basic colors. This color television system is compatible with black-and-white reception. At the studio, the image is projected in three basic colors on three transmitting tubes with the aid of a color-separating system. After amplification, the three signals are

admitted to the spectrum compression device of the video signal. The compressed spectrum of the video signal is fed to a 100-w transmitter. The method of modulation in quadrature of a single subcarrier by color-difference signals has been selected for this system.

Recently the Moscow Electric Bulb Plant developed a shadow-mask tricolor kinescope with a 53-cm screen. The screen of this tricolor kinescope is made of 1,300,000 luminescent dots.

Three studio and two motion-picture channels have been assigned to the Moscow experimental color television broadcasting station. Some of the operating parameters of the Moscow station are as follows: 625 lines per frame; 25 frames per second; 6.5-Mc spacing between audio and video carriers; subcarrier frequency, 4,429,637.5 cycles $\pm$ 13; the band width of the color difference signal for R-Y and B-Y, 1.5 Mc.

This experimental color television broadcasting station is aimed at determining the reliability and adaptability of the recently designed transmitting and receiving equipment.

43. Hungarians Report on Lithuanian "Wireless Loud-Speaker"

"Lithuanian Radio Engineers" (unsigned news item); Budapest; Nepszabadsag, 25 Sep 59; p 10.

Lithuanian radio engineers have designed a wireless loud-speaker. The set receives and relays central transmissions in a radius of 100 kilometers [sic]. In the future, they will manufacture 10,000 wireless loud-speakers.

44. Soviet Transistor Television Set

"Tubeless Television Set" (unsigned article)' Budapest, Nepszava, 16 Sep 59, p 4

Miniature semiconductor components are used in the "Sputnik 2" model television set in lieu of tubes. A 12-volt battery is necessary for the power supply. Operation of the set is unusually economical. For example, the receiver can be installed in an automobile and requires only 13.2 watts, whereas the best models to date operate at 105 watts. The "Sputnik 2" weighs scarcely 2 kilograms, whereas the lightest sets heretofore weighed 16 kilograms. The new set has a 200- x 150-mm picture screen.

Components

45. Thermistor Time Relays

"Generator Time Relays with Semiconductor Thermistors," by N. P. Udalov and Ye. V. Zaytsev, Moscow Aviation Institute imeni S. Ordzhonikidze; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 8, Aug 59, pp 33-38

Investigations of transient processes in circuits with semiconductor thermistors conducted at the B. N. Petrov Laboratory of the Moscow Aviation Institute have shown that the thermistors with volt-ampere response and well-defined decay region are capable of securing time delay controllable within wide time limits, up to a value ten times greater than the time constant of the incorporated thermistor. Although a circuit with such a thermistor ensures reliable operation of an electromagnetic relay at constant temperature, fluctuation of ambient temperature will greatly influence its performance.

An investigation of the performance of various time relays has shown that best results can be obtained with circuits in which the thermistors are periodically heated and cooled. Such periodically heated devices have been called generator time relays. The magnitude of the time delay can be adjusted in this circuit either by changing the duration of the period or by rotating a ratchet wheel, incorporated in the device, to a desired number of cycles. This generator time relay is capable of maintaining a 900-sec time delay with an accuracy of $\pm 1.5\%$.

The author suggests that industrial-scale production of heated thermistors with a temperature stabilizing circuit to be initiated in the near future.

Materials

46. Purification of Selenium by Filtration of Sulfite Solutions of This Element

"The Role of Filtration of Selenium Sulfite Solutions in the Production of Pure Selenium," by O. V. Al'tshuler, Ye. A. Subbotina, and F. F. Kharakhonin, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Prikladnoy Khimii, Vol 32, No 7, Jul 59, pp 1420-1426

The only industrial method for the production of semiconductor selenium applied in the USSR at present is the sulfite method. Technical selenium

derived from copper electrolysis sludge and from sulfuric acid production is dissolved in an aqueous sodium sulfite solution. The hot solution is filtered and cooled. On cooling, a part of the selenium precipitates in a crystalline form. The mother liquid is used to dissolve fresh batches of selenium.

As a result of being treated in this manner, the selenium is freed of the major portion of impurities contained in it: the total content of impurities is lowered from 2-2.5% to a few thousandths of 1%. The possibilities and limitations of purification by filtration of the sulfite solution were investigated in the work described. The impurities removed by filtration consist mainly of extraneous metals and tellurium. It was established that filtration is most effective as far as separation of the main quantity of impurities contained in technical selenium is concerned. It is also effective to a large extent in bringing about the high degree of purity required of standard selenium to be used in rectifiers. By applying the method of spectral analysis and radioactive tracer methods, the effectiveness of filtration from the standpoint of removal of individual impurities, the dependence of the degree of purification on the filtering material, and the effect of the age of the solution were investigated. It is concluded on the basis of the results obtained that tellurium and tin are at present in a pseudo-colloidal state in the sulfite solution. The pseudo-colloidal particles gradually coagulate and become larger as the solution is aged. Unlike tellurium, tin is not completely eliminated from the solution even when filtration through very dense filters is carried out. The same applies to iron. It is assumed that the use of more effective filtering materials will play a decisive role in the development of improved methods for the production of very pure selenium.

47. The Properties of Mixed Cadmium Sulfide-Cadmium Telluride Single Crystals

"Preparation and Some Characteristics of Mixed CdS-CdTe Single Crystals," by N. I. Vitrikhovskiy and I. B. Mizetskaya, Institute of Physics (Kiev), Academy of Sciences Ukrainian SSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 996-999

Mixed single crystals of cadmium sulfide-cadmium telluride were prepared by a sublimation method applied earlier for the preparation of mixed cadmium sulfide-cadmium selenide single crystals. The chemical composition and crystal structure of the crystals prepared were determined. Furthermore, the spectral distribution of the photoconductivity of CdS single crystals containing Te was studied.

By using the method described, single crystals with a maximum content of Cd Te amounting to 3.5% were obtained. This new type of semiconductor crystals was found to crystallize in the hexagonal system and to have cell dimensions close to those of crystals of pure cadmium sulfide. The maximum of the photo current of the mixed single crystals was found to be displaced toward longer wave lengths as compared with the maximum exhibited by pure Cd S. The shift of the maximum was proportional to the content of Cd Te in percent.

48. Preparation of Lead Sulfide Photoresistances by Chemical Precipitation

"Lead Sulfide Photoresistances Deposited by Chemical Precipitation," by R. Ya. Berlage, F. T. Novik, and L. P. Strakhov, Problem Laboratory of Semiconductors, Leningrad State University; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 995-996

The sensitivity of photoresistances consisting of lead sulfide prepared by treating lead acetate with thiourea was investigated.

49. Purification of Germanium by Coating With Rhodium

"Extraction of Copper and Nickel From Germanium," by K. P. Tissen, Physical Faculty, Moscow State University; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 1001-1003

It was established in the work described that extraction of readily diffusing impurities (Cu and Ni) can be achieved with facility by subjecting to heat treatment germanium that has been coated electrolytically with rhodium. On the other hand, heat treatment of germanium coated with nickel or coated with both nickel and rhodium makes it possible to introduce nickel into germanium by diffusion without noticeable formation of thermooacceptors.

50. Preparation of Pure Silicon by Thermal Decomposition of Silane

"Some Improvements in the Preparation of Pure Silicon by the Thermal Decomposition of Silane," by Ya. Ye. Pokrovskiy, S. I. Kleshchevnikova, and Ye. I. Rumyantseva, Physical Faculty, Moscow State University; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 999-1001

Equipment for the preparation of pure silicon by the thermal decomposition of monosilane was described by the authors of this article in Zhurnal Tekhnicheskoy Fiziki, Vol 27, 1957, p 1645. A number of shortcomings became apparent in the operation of this equipment. These shortcomings were eliminated by modifying the equipment. The changes that have been made in the equipment are described in detail.

51. Dielectric Polarization of Solid Solutions of Niobates and Tantalates of Barium and Strontium

"Dielectric Polarization of Solid Solutions in the Systems (Ba, Sr) (Ta, Nb)₂ O₆," by G. A. Smolenskiy, V. A. Isupov, and A. I. Agranovskaya, Institute of Semiconductors (Leningrad), Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 992-995

Investigation of the temperature dependence of dielectric permeability of solid solutions in the system (Ba, Sr) (Ta, Nb)₂ O₆ indicated that these solutions exhibit the dielectric hysteresis loop which is typical for siegnettoelectrics.

52. Compound Siegnettoelectrics

"New Compound Siegnettoelectrics; Part 3 -- Pb₂ Mg W O₆, Pb₃ Fe₂ WO₉, and Pb₂ Fe Ta O₆," by G. A. Smolenskiy, A. I. Agranovskaya, and V. A. Isupov, Institute of Semiconductors (Leningrad), Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 990-992

The lead magnesium tungstate of the composition indicated above was synthesized and found to have a structure of the perovskite type. On the basis of the type of dependence of the dielectric polarization of this compound on the intensity of the field, the conclusion was made that the phase transition in lead-magnesium tungstate is of the antisiegnettoelectric type. The lead-iron tungstate of the composition indicated in the title was also synthesized. It was established that this compound has a crystal structure of the perovskite type and exhibits a dielectric hysteresis loop which is typical for siegnettoelectrics. Lead-iron tantalate,

similarly to lead-iron niobate, which had been investigated in earlier work, was also found to be siegnetteoelectric. The tantalate also exhibits a perovskite structure.

53. Solid Indium Antimonide-Gallium Antimonide Solutions

"Equilibrium Solid Solutions in the System InSb-GaSb," by V. I. Ivanov-Omskiy and B. T. Kolomiyets, Leningrad Physico-technical Institute, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 913-918

Results are discussed which were obtained by applying the method of zone equalization to prepare equilibrium solid solutions of InSb-GaSb.

54. Conductivity of Antimony Triselenide

"Conductivity and Photoconductivity of Antimony Triselenide Layers," by B. T. Kolomiyets, D. M. Lyubin, and D. V. Tarkhin; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 899-902

Results are reported of an experimental investigation of some electrical, photoelectrical, and optical properties of Sb_2Se_3 layers prepared by evaporation in vacuum of initial material of different degrees of purity. It was established that the increase in the relative resistance in the dark is higher in antimony selenide layers than in single crystals or polycrystalline samples.

55. Properties of Some Siegnetteoelectric Solid Solutions Based on Sodium Niobate

"Dielectric Polarization and Piezoelectric Properties of Some Siegnetteoelectric Solid Solutions Based on Sodium Niobate," by V. A. Isupov and V. I. Kosyakov, Institute of Semiconductors (Leningrad), Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, pp 929-234

The dielectric polarization (in strong and weak fields) and piezoelectric properties of solid solutions formed by barium, strontium, and lead methaniobates with sodium niobate were investigated. It was found that at some compositions in the system sodium niobate-lead

methaniobate, the piezoelectric characteristic d_{31}/ϵ has high values and is stable in an extensive range of temperatures. It was also established that the piezoelectric characteristics of solid solutions of strontium methaniobate in sodium niobate have low values and are not stable in an extensive temperature range. At minus 196°C , loops of dielectric hysteresis are observed in polycrystalline samples of sodium niobate.

56. Dependence of Conductivity of Polymers on Temperature

"Dependence of the Electrical Conductivity of Polymers on the Temperature," by N. I. Shishkin and M. P. Vershinina, Physicotechnical Institute (Leningrad), Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 5, May 59, pp 798-802

This article reports experimental data concerning dependence of the electrical conductivity of polystyrene, polymethylmethacrylate, polyvinylacetate, polyvinylbutyral, polyvinylformal, and polyvinylethylal on the temperature in the regions above and below the temperatures of vitrification. The conclusion is made that the relationships pertaining to the dependence of the electrical conductivity of polymers on the temperature are the same as those which apply to supercooled monomeric liquids and glasses.

[For additional information on electronic materials, see also Chemistry, Inorganic Chemistry.]

Wave Propagation

57. Electromagnetic Wave Propagation in Helix Wave Guide

"Effect of the Magnetodielectric Medium on Propagation of Electromagnetic Waves in a Helix Wave Guide Embedded in Magnetodielectric Material," by B. M. Bulgakov and V. P. Shestopalov, Khar'kov State University; Moscow, Izvestiya Akademii Nauk SSSR, Energetika i Avtomatika, No 4 Jul/Aug 59, pp 166-176

Investigation of systems incorporating both helix and magnetodielectric medium are of great importance to understanding the behavior of VHF waves. Utilization of magnetodielectric components permits improving some parameters

of traveling-wave tubes, such as amplification factor and physical dimensions. Still other fields of application for helix wave guides placed in a magnetodielectric medium have come to prominence recently, such as measurement of the dielectric constant of materials, and utilization as small wide-band antennas, as delay lines in traveling-wave tubes, and as matching devices in helix wave guides. The helix wave guide embedded in magnetodielectric material can also be utilized for channelizing electromagnetic waves.

The article discusses approximation analysis of a helix wave guide placed in a laminar-isotropic axially symmetrical magnetodielectric medium. A valuable characteristic of the helix wave guide embedded in a magnetodielectric medium is the possibility of controlling power flux redistribution in the system by changing the parameters of the wave guide, as well as the possibility of controlling the characteristic impedance of the wave guide.

V. ENGINEERING

Automatic Control Engineering and Computers

58. Self-Adjusting Systems With Two-Step Regulation

" Calculation of Self-Adjusting System With Two-Step Regulation of Parameters," by Yu. M. Kozlov; Moscow, Izvestiya Akademii Nauk SSSR, Energetika i Avtomatika, No 4, Jul/Aug 59, pp 112-115

The problem of calculation and design of self-adjusting systems operating under the influence of random interferences requires selection and appraisal of devices which are capable of performing accurate evaluation of the parameters of the input signal. Such an input-signal evaluating device for a simple, pulse-actuated, self-adjusting system can be in the form of a system error analyzer connected at the output of a pulse discriminator which, after evaluation of the signal, sends a command to a relay for proper connection to an appropriate unit.

The method of mathematical statistics widely used in appraisal of optimal detection of a signal having appreciable noise background has been applied in this study for evaluation of self-adjusting systems. The discussed method of calculation is applicable only to simple, two-step, self-adjusting systems; for multistep or continuous regulation and for cases involving a wide variety of signals, a different statistical method, not discussed here, should be applied.

59. Optimal Redundancy of Fully Automated Systems

"A Problem in Optimal Redundancy of Equipment," by Kh. L. Smolitskiy and P. A. Chukreyev; Moscow, Izvestiya Akademii Nauk SSSR, Energetika i Avtomatika, No 4, Jul/Aug 59, pp 79-85

The problem of individual redundancy for each element of automated equipment to secure maximum reliability without exceeding permissible limits in weight, over-all dimensions, or cost is of utmost importance in the design of fully automated systems.

The article presents a generalized mathematical calculation of optimal redundancy for each component of an automated system when the degree of reliability of the individual components varies to a considerable degree.

60. Complex Automation of Electric Power Systems

"Complex Automation of Electric Stations," by N. V. Pautin;
Moscow, Vestnik Akademii Nauk SSSR, No 9, Sep 59, pp 36-41

The Institute of Electric Controlling Machines, Academy of Sciences USSR, during the past few years, has been working on the design of a complex controlling device to improve the operating characteristics of a large number of multiunit electric stations supplying power to a common network. Such complex controlling devices were used for the first time on electric stations of the Unified Southern Power System, incorporating most of the stations of southern European USSR.

In cooperation with the Automation and Telemetering Protection Service of the Rostovenergo and the Tsimlyanskaya Hydroelectric Station, a complex controlling device was developed which permits regulating the operation of the Tsimlyanskaya Station from a dispatcher point several hundred kilometers away. This newly designed controlling device will regulate the static and astatic frequency stability of the whole Unified Southern Power System, connect and disconnect automatically a desired number of generating units, switch on and off a desired number of generating units to operate as synchronous converters, and properly distribute the load and reactive power among the generating units. In the frequency and active power regulation circuits, new electronic devices, such as germanium rectifiers and transistors, were used.

The institute is continuing research to develop new and improved automatic control equipment. It has designed an electrohydraulic regulator intended to control frequency and active power in a group of generating units. The outstanding feature of this device is that it actuates the control system of the hydraulic turbine independently of the speed governors. The latter feature improves speed regulation and will eventually dispose of the need for individual speed governors of generating units. This will substantially simplify the control system and improve reliability of performance. Load distribution among the generating units is accomplished with the aid of an adder unit in the form of a differential magnetic amplifier.

61. Description of New East German Analog Computer EARI

"The Electronic Analog Computer Ilmenau EARI," by H. Winkler and D. Schreier; Berlin, Nachrichtentechnik, No 10, Oct 59, pp 437-442

The EARI computer, designed and developed by a group of associates at the Physics Institute, Advanced School for Electrical Engineering, Ilmenau, was demonstrated for the first time in the spring of 1959. The

computer was designed in accordance with the expressed needs of East German research and development stations. It is to be used in an already provided computer station. It is described as a practically universal fast analog computer "with repeating operation" and especially suited for the solution of nonlinear differential equation systems, including boundary and eigenvalue problems. It is built in the form of racks with removable units and can, thus, be expanded as desired to handle special problems. The analog variables are time (independent) and computing voltage (dependent). The machine unit is plus-minus 30 volts. The analog units are free of feedback; they have low-ohmic outputs and high-ohmic inputs. The accuracy is 0.5-5 percent.

Industrial production will be by VEB Archimedes, Glashuette, under VVB Bueromaschinen, Erfurt.

Civil Engineering

62. Surveyors' Difficulties

"Experience of Using Tripod Extensions in a Systematic Preparation for Aerial Photographs," by F. D. Rodionenko; Moscow, Geodeziya i Kartografiya, No 6, Jun 59, pp 43-44

Workers of the Kazakh Aerogeodetic Enterprise who conducted a systematic survey for aerial photographs in 1958 for a combined survey of a river lowland portion on a scale of 1:10,000 experienced difficulties in determining resection and intersection identification markers. High plant growth [haloxylon] in the area made observation of triangulation points impossible in the majority of cases.

To overcome this, members of the party resorted to homemade tripod extensions for their theodolite and a raised platform for the instrument men.

63. New Geodetic Instrument, the TVO-1 Theodolite

"The High-Precision Optical Theodolite TVO-1," by Ye. T. Edobnikov; Moscow, Geodeziya i Kartografiya, No 2, Feb 59, pp 35-43

A new high-precision optical theodolite, designated the TVO-1, has been designed and built by the collective of designers, engineers, and the best aerogeodetic instrument makers of the Aerogeoinstrument Plant, in cooperation with S. V. Yeliseyev, candidate of Technical Sciences, a TsNIIGAIK [Central Scientific Research Institute of Geodesy, Aerial Surveying, and Cartography] representative.

The experimental model of the TVO-1 was produced at the end of 1957. Laboratory and field tests conducted in the summer and fall of 1958 showed that the instrument can be successfully used for horizontal and vertical measurements in first order triangulation. It is also adaptable for other work requiring high accuracy. Normal operation of the TVO-1 is ensured in temperatures from -25 up to +500 C.

Design characteristics of the instrument are given. Two photographs of the theodolite are shown.

Electrical Engineering

64. World's Largest Hydraulic Turbine

"Leningrad's Contribution to Bratsk" (unsigned article); Moscow, Promyshlennno-Ekonomicheskaya Gazeta, 18 Oct 59

The Leningrad Metals Plant is now building for the Bratsk Hydroelectric Station a 228,000-kw hydraulic turbine, which will be the largest ever built. The inlet end of the spiral scroll casing of this turbine will have a diameter roughly equal to the height of a three-story building; through this opening 250 cubic meters of water will flow to the water wheel each second. The spiral casing, made of high-alloy welded plates, will weigh about 135 tons.

An experimental prototype water wheel fabricated from welded castings will reduce over-all weight considerably. The heavy upper and lower runner rings were cast at the Nevskiy Machine Building Plant; seven stationary runner buckets will be welded to these runner rings.

The Institute of Electric Welding imeni Ye. O. Paton of the Academy of Sciences Ukrainian SSR and the Central Scientific Research Institute of Technology and Machine Building are engaged in solution of some of the more complicated manufacturing phases of these turbines. The first two hydraulic units are scheduled for completion in 1960.

65. Electrohydraulic Governor for Power Generating Units

"Primary Electrohydraulic Governor of Master Station Unit for Frequency Regulation of Power Systems," by K. N. Kamkamidze, Georgian Polytechnic Institute imeni S. M. Kirov; Minsk, Izvestiya Vysshikh Uchebnykh Zavedenii, Energetika, No 9, Sep 59, pp 16-23

A steady increase in the capacity of modern power generating systems has imposed rigid requirements on frequency and active power regulators. Many of the existing regulators are not able to cope successfully with the control problems existing in modern large power stations and distribution networks.

The Chair of Automation of Industrial Processes of the Georgian Polytechnic Institute, during the past few years, has been conducting research to develop a fast-response electrohydraulic frequency regulator based on the idea of combining the conventional criterion for control of angular velocity deviation with that of the frequency derivative ($\frac{df}{dt}$) or else with the difference between the mechanical and electrical power of the unit. The Tbilisi Scientific Research Institute for Instrument Building and Automation Equipment, in cooperation with the Central Grusenergo Laboratory, has built an attachment for conventional speed governors operating on the above described principle. The attachments were installed, for testing purposes, on the primary governor of a large hydraulic generating unit in the Grusenergo System. The electrohydraulic attachment consists of a phase-sensitive bridge, electromagnetic relay, auxiliary slide valve, and servomotor.

Oscillograms taken with a generator fitted with an electrohydraulic regulator have shown a decided improvement in frequency stability.

66. Large Capacity Gas Turbines

"Design of Large Capacity Gas-Turbine Installations," by V. V. Uvarov, A. P. Chernobrovkin, V. S. Beknev, E. A. Manushin, and O. M. Pankov, Moscow Higher Technical School; Moscow, Teploenergetika, No 11, Nov 59, pp 8-16

The recent tendency in the USSR to wider use of oil and natural gas for power generation has created the need for large-capacity, efficient gas turbines. Research conducted at the Moscow Higher Technical School has shown that large gas turbine installation costs are roughly 70% (or less) of steam turbine installation costs; gas turbine efficiency is comparable to that of high-pressure steam turbines.

Now, the Khar'kov Turbine Plant is designing a 50,000-kw gas turbine, and the Leningrad Metals Plant, a 100,000-kw gas turbine. Theoretical research conducted at the Moscow Higher Technical School has shown that the design of a 300,000-kw gas turbine operating at a gas temperature of about 750° C is quite feasible. The design features of the gas turbines which will increase their capacity are as follows: increase of shaft speed at the final stage of the turbine and an application of special diffuzors; elimination of regenerators and replacement of them with auxiliary coolers and intermediate combustion chambers and reduction of pressure to 60-80 atmospheres; and connection of electric-generator shaft to the shafts of high- and medium-pressure gas turbines.

Efforts are being made to demonstrate the feasibility of construction of gas turbines up to 400,000 kw with an efficiency as high as 40% and turbines up to 600,000 kw with efficiency as high as 39%. It has been estimated that the weight of a 300,000-kw gas turbine should be about 1,200 tons. Cooling water consumption of a gas turbine would be approximately one eighth of that needed for an equivalent steam turbine installation.

The flow-chart of the 300,000-kw gas turbine installation designed at the Moscow Higher Technical School incorporates four gas turbines for various stages and five compressors.

67. Soviet Solar Turbine Described

"Solar Turbine" (unsigned article); Prague, Obrana Lidu, 9 Aug 59, p 6

An article in source, which is a daily newspaper published by the Czechoslovak Ministry of National Defense, describes what is called a Soviet solar turbine, invented by A. G. Presnyakov, a Soviet scientist, in an effort to find a solution to the problem of converting solar energy directly into electricity, without the intermediate steps of first converting it into heat to activate a steam turbine which produces electric power. The invention is based on the existence of the Curie Point in metals. Various metals, such as iron, nickel, cobalt, and a number of alloys, have a low Curie Point and thus lose the ability to become attracted by magnets at a temperature as low as 36 degrees centigrade.

The solar turbine is described as a large wheel of metal vanes, passing through permanent magnets mounted at opposite sides along its circumference. At room temperature, the wheel is at rest. However, when a small segment of the wheel is heated beyond the Curie point of the metal it is made of, the delicate balance of the wheel is disturbed, and the heated portion ceases to be attracted by the magnet, which in turn begins to attract the adjoining cooler segment, thus setting the wheel in motion.

According to the report, which is based on information "from the Soviet press," the heat source for the turbine wheel could very well be the sun, whose rays can be concentrated through a series of mirrors and lenses. Soviet technology has developed permanent magnets whose lifting power is many times their own weight and which are so durable that they could remain in service for an indefinite period.

The article, which is accompanied by an artist's sketch of the solar turbine, concludes by stating that "as soon as all problems are solved, the solar turbine will be put into service in the southern part of the USSR."

Miscellaneous

68. Budapest Photography Conference Brings Together East and West Experts

"Scientific and Applied Photography Conference Begins Work"
(unsigned news item); Budapest; Nepszabadsag, 4 Sep 59, p 10

The Optical and Cinematechnological Association [Hungarian] held its first scientific and applied photography conference in 1957. The second meeting opened yesterday [3 September 1959] in Budapest with the participation of experts from the Soviet Union, East Germany, Czechoslovakia, Poland, Rumania, Bulgaria, West Germany, Belgium, France, and England. The scientific conference is being attended by 70 Hungarians and 40 foreigners. W. F. Berg, England, spoke about the advantages of such East-West conferences.

The conference is divided into three thematic groups: theoretical problems of fundamental photographic processes; industrial and technological problems; and laboratory techniques.

The conference was opened by Dr Alfred Polster, and then the participants were greeted by Janos Molnar, technical director of the Postal Experimental Institute and president of the association. The foreign participants will visit Vac and the Forte Photochemical Industry Research Laboratory.

69. Hungarians Report Soviet Ornithopter

"Wing Flapping Airplane" (unsigned news item); Budapest; Nepszabadsag, 2 Oct 59; p 6.

Soviet pilot Dmitriy Ilyin has designed an ornithopter -- an airplane that flaps its wings. His device can fly at 100 kilometers per hour.

VI. MATHEMATICS

70. Continuous Functions Approximated by Entire Functions

"On the Approximation of Continuous Functions by Entire Functions on the Real Axis," by G. M. Avetisyan, Leninakan Pedagogical Institute imeni M. Nalbandyan; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 5(12), Sep/Oct 59, pp 3-15

Approximations of continuous functions by entire functions are considered. Significant progress on this theory was obtained in the work of M. V. Keldysh, "On the Approximation of Holomorphic Functions by Entire Functions," DAN SSSR, Vol 47, No 4, 1945. If a function is analytical in a strip or in a circle, then it is possible to limit the growth of the approximating function as a function of the velocity of increase of the analytical function. It is already known that in the case of functions defined and continuous on the real axis, it is impossible to limit the growth of an approximating entire function as a function of the growth of the given continuous function.

By a corresponding choice of a continuous and bounded function $f(x)$, it is possible to attain that from the inequality

$$\sup_{-\infty < x < \infty} |f(x) - G(x)| < \epsilon < 1/2 \quad (1)$$

it follows that $\max_{|z| \leq r} |G(z)|$ increases more rapidly than the

arbitrary function given previously. This observation proves that in order to conduct an estimate of the growth of the approximating entire functions on the continuous function $f(x)$, it is necessary to superimpose certain additional limitations, on which the growth of the functions $G(z)$, satisfying the inequality (1), will depend.

M. V. Keldysh proved that if

$$\max_{-x \leq t \leq x} |f'(t)| < c x^\nu,$$

then for any $\epsilon > 0$, there exists an entire function of order not greater than $\nu + 1$ satisfying the inequality

$$|f(x) - G(x)| < \epsilon$$

on the real axis.

In the present work, a more general case is considered, namely, the possibility is proven for the uniform approximation of a continuous function by entire functions where

$$\sup_{-x \leq \xi \leq x+\gamma} |f'(\xi)| \leq M(x) \quad \text{for any } \gamma > 0, \text{ where}$$

$$M(x) \equiv \max_{-x \leq \xi \leq x} |f'(\xi)| \quad \text{is an arbitrary positive function}$$

increasing on the entire real axis. The growth of an entire function is simultaneously estimated as a function of the increase of a continuous function and of the rapidity of the approximation.

71. Periodicity of Solutions for Certain Linear Systems of Differential Equations

"The Necessary and Sufficient Conditions for the Periodicity of a Fundamental System of Solutions of Certain Linear Systems of Differential Equations," by P. B. Golokvoschus; Minsk, Doklady Akademii Nauk BSSR, Vol 3, No 7, Jul 59, pp 287-291

On the basis of the general theory (see N. P. Yerugin, Metod Lappo-Danilevskogo v teorii lineynykh differentsial'nykh uravneniy [The Lappo-Danilevskiy Method in the Theory of Linear Differential Equations], Izd. Leningradskogo un-ta, 1956, pp 71-78) and the corresponding integral substitution V (for $t=1$), the following criteria for the periodicity of all the solutions of systems of the two linear homogeneous differential equations considered in the works of G. F. Fedorov ("Properties of Matricies of the Second Order and Their Application to the Solution in Quadratures of Certain Systems of Differential Equations," Izv. VUZ, Matematika, No 3, 1958; and "Several New Cases of the Solution for a System of Two Linear Differential Equations in Finite Form," Vestnik IGU, No 11, 1953) and in the above-mentioned work of N. P. Yerugin are obtained.

The functions $\varphi_k(t)$ are not compulsory periodic in the works of N. P. Yerugin and G. F. Fedorov.

Investigation of the system considered in the work of Yerugin (pp 35-38) leads to the following results:

Let there be continuous periodic functions $\varphi_k(t)$ ($k=1,2$) of period $\omega = 1$ having property

$$\int_0^1 \varphi_k(t) dt = 0 \quad (k=1,2) \quad (1)$$

In a system given by the matrix form

$$\frac{dx}{dt} = X[U_1 \varphi_1(t) + U_2 \varphi_2(t)] \quad (2)$$

where the U_1 and U_2 are constant matrices having one of the two forms

$$U_1 = \begin{vmatrix} a & 0 \\ c & a \end{vmatrix}, \quad U_2 = \begin{vmatrix} b_1 & 0 \\ 0 & b_2 \end{vmatrix}, \text{ or} \quad (3)$$

$$U_1 = \begin{vmatrix} a+2cm & -cm^2 \\ c & a \end{vmatrix}, \quad U_2 = \begin{vmatrix} b & m^2n \\ n & b \end{vmatrix}. \quad (4)$$

There are introduced the notation

$$\alpha = \begin{cases} b_2 - b_1 & \text{for condition (3)} \\ 2mn & \text{for condition (4) and the function} \end{cases} \quad (5)$$

$$I(\alpha) = \sum_{k=0}^{\infty} \frac{a_k}{k!} \alpha^k, \quad (6)$$

$$\text{where } a_k = \int_0^1 L_2^k(t) \varphi_1(t) dt \quad (k = 0, 1, 2, \dots), \quad (7)$$

$$\text{and } L_2(t) = \int_0^t \varphi_2(u) du \quad (8)$$

are continuous periodic functions of period $\omega = 1$.

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The following theorems were proved in the work:

Theorem 1. All solutions of the system (2) will be periodic of period $\omega = 1$ when and only when α is a root of the function (6).

Theorem 2. Concerning the system

$$\frac{dx}{dt} = X[U_0 \varphi_0(t) + U_1 \varphi_1(t) + U_0 U_1 \varphi_2(t) + U_1 U_0 \varphi_3(t)], \quad (9)$$

where U_k ($k=0,1$) are matrices of the second order with determinants equal to zero, but the determinant $D(U_0 + U_1) \neq 0$, all solutions of the system (9) will be periodic of period $\omega = 1$ when and only when the condition

$$(\sigma_1 U_0 - \sigma_{01}) U_1 \int_0^1 \psi_e(t) [\varphi_1(t) + \sigma_0 \varphi_2(t)] dt = 0, \quad (10)$$

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holds where

$$\psi(t) = \sigma_0 \int_0^t \varphi_0(u) du - \sigma_1 \int_0^t \varphi_1(u) du + \sigma_{01} \int_0^t [\varphi_3(u) - \varphi_2(u)] du \quad (11)$$

are continuous periodic functions of period $\omega = 1$, and σ_{01} is the trace of the product $U_0 U_1$.

Theorem 3. Concerning the system

$$\frac{dX}{dt} = X \sum_{k=0}^2 \bar{U}_k \varphi_k(t), \quad (12)$$

in which $\bar{U}_k$ ($k = 0, 1, 2$) are any matrices of the second order, and $\varphi_k(t)$ ($k = 0, 1, 2$) are continuous periodic functions of order $\omega = 1$, satisfying the condition

$$\int_0^1 \varphi_k(t) dt = 0 \quad (k=0, 1, 2),$$

all solutions of the system (12) will be periodic of period $\omega = 1$ when and only when the condition

$$\begin{aligned} (\sigma_1 U_0 - \sigma_{01}) U_1 \int_0^1 e^{\psi(t)} \left\{ \varphi_1(t) + \right. & (13) \\ \left. + \frac{[\sigma_{01}\sigma_{02} - \sigma_0(\sigma_{012} + \sigma_{102})]\sigma_0}{\sigma_{01}(\sigma_{01} - \sigma_0\sigma_1)} \varphi_2(t) \right\} dt = 0 \\ (\sigma_{01} \neq 0, \sigma_{01} - \sigma_0\sigma_1 \neq 0), \end{aligned}$$

holds where

$$\psi(t) = -\sigma_1 \left[\int_0^t \varphi_1(u) du + \frac{\sigma_{01}\sigma_{02} - \sigma_0\sigma_{012}}{\sigma_{01}(\sigma_{01} - \sigma_0\sigma_1)} \int_0^t \varphi_2(u) du \right] \quad (14)$$

are continuous periodic functions of period $\omega = 1$.

Theorem 4. Concerning the system

$$\frac{dX}{dt} = X \sum_{k=0}^2 U_k \varphi_k(t) \quad (15)$$

let U_k ($k=0, 1, 2$) be matrices of the second order with zero invariants and let $\varphi_2(t)$ be a continuous periodic function of period $\omega = 1$ satisfying the condition (1). Further, let σ_{012} be the trace of the matrices $U_0 U_1 U_2$, $U_1 U_2 U_0$, and $U_2 U_0 U_1$ and let it satisfy the identity

$\sigma_{01}\phi_0(t) + \sigma_{12}\phi_2(t) = 0$, then all solutions of system (15) will be periodic of period $\omega = 1$ when and only when

$\alpha = \frac{2\sigma_{012}}{\sigma_{01}} (\sigma_{01} \neq 0)$ is a root of function (6) where

$$a_k = (-1)^k \int_0^1 L_2^k(t) [\phi_1(t) + \frac{\sigma_{02}}{\sigma_{01}} \phi_2(t)] dt \quad (k=0,1,2,\dots) \quad (16)$$

Theorem 5. All the solutions of system (15) will be periodic of period $\omega = 1$ when and only when the condition

$$\int_0^1 F_1(t) \exp\left(\frac{2\sigma_{01}}{a} (a-b) L_2(t)\right) dt = 0 \quad (\sigma_{01} \neq 0, a \neq 0) \quad (17)$$

holds where $L_2(t) = \int_0^t F_2(u) du$ (18).

VII. MEDICINE

Bacteriology

72. Effect of Sublethal Doses of Botulinus Toxin Studied

"The Action of Multiple Sublethal Doses of Botulinus Toxin on the Organism," by K. I. Matveyev, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 9, Sep 59, pp 71-78

The effect of multiple sublethal doses of botulinus toxins on guinea pigs, rabbits, and mice was studied comparatively to provide an explanation of Bering's observation that animals which have received small doses of diphtheria and tetanus toxins acquire increased sensitivity to these poisons. Three series of experiments were performed in which all animals were given decreasing doses of dry type A botulinus toxin whose lethal dose had been established.

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Results are presented in tabular form and are discussed in the text. The following conclusions are given on the basis of these results.

"1. Cl. botulinum toxin introduced several times in sublethal doses to guinea pigs, rabbits, and mice caused botulism and death, although the total dose of toxin introduced was considerably less than the lethal dose. The animals remained healthy when the entire amount of toxin used for the multiple injections was administered at one time.

"2. Guinea pigs were found to be the most sensitive to multiple sublethal doses of A toxin; rabbits and mice were less sensitive.

"3. Following the introduction of small doses of toxin, the vessels of the animals at first acquired increased sensitivity, and later, immunity.

"4. The cumulative effect of sublethal doses of toxin on the organism plays a large part in the pathogenesis of botulism."

73. Survival of R. burneti in Liquid Media

"Certain Rules for the Survival of Rickettsia burneti in Liquid Media," by V. F. Ignatovich, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 9, Sep 59, pp 111-116

Inasmuch as a search of the literature yielded no data on the effect of temperature, pH, and composition of media on the survival of Rickettsia burneti in liquid media, the author tested these effects on one standard yolk culture of R. burneti, Grita strain. These data are deemed necessary for the general biological characterization of this pathogen as well as for the preparation of antigens, vaccines, etc.

The culture was used in a dilution of 10^{-4} , which amounted to a 10^5 - 10^6 infecting dose for chick embryos and guinea pigs. Five media were employed: (1) a phosphate buffer with different pH values--5.0, 6.0, and 8.0; (2) a 10% solution of glycerin in a phosphate buffer with a pH of 8.0; (3) tap water with a pH of 6.83-8.61; (4) distilled water with a pH of 7.5-8.22; and (5) goat's milk with a pH of 6.5-6.6. The LP-5 potentiometer was used to measure pH. Temperatures tested were 4-6°, 15-20°, and 34-36° C.

The results of these experiments are shown in three tables and are expanded in the text. The following conclusions are presented:
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"1. Several laws governing the survival of Rickettsia burneti in liquid media (skimmed milk, a phosphate buffer solution, phosphate-glycerin medium, tap and distilled water) with a quantitative evaluation of the death of the Rickettsia manifested by infecting doses for chick embryos, were studied.

"2. Temperature is one of the determining factors which affect the survival of Rickettsia burneti in liquid media. A low temperature (4-6°) facilitated longer preservation of Rickettsia; increased temperature (15-36°) accelerated the death of Rickettsia burneti.

"3. Of the medium reactions tested, a weakly alkaline one (pH 8.0) was found to be the most favorable; a weakly acid reaction (pH greater than 5.0 and less than 7.0) accelerated the death of Rickettsia burneti.

"4. The defensive role of protein in the preservability of Rickettsia burneti in a liquid medium at all the temperatures studied was revealed."

Biophysics

74. Effect of Ultrasonic Irradiation on Distilled Water

"The Effect of Ultrasound on Distilled Water," by M. S. Levinson and B. G. Kovrov, Laboratory of Biophysics of the Institute of Physics, Academy of Sciences USSR, Krasnoyarsk; Moscow, Biokhimiya, Vol 24, No 3, May/June 59, pp 535-538

The study of the effect of ultrasound on aqueous solutions of various chemical compounds and on biological objects commands significant interest. Because of this, the authors studied the effect of irradiated distilled water on hemoglobin.

The authors present the following conclusions:

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"Distilled water subjected to the effect of ultrasound can oxidize hemoglobin with its subsequent conversion into hematin. This effect cannot be attributed to the action of hydrogen peroxide or of nitrous or nitric acids. It takes place only in the presence of negligible amounts of hydrogen ions, which evidently catalyze the reaction. Experimental ultrasound treatment conducted in the atmosphere of various gases and also in degassed water without air indicate that the source of the formation of the oxidizing agent is the water itself. It is suggested that the hemoglobin oxidizing agent is a higher hydrogen peroxide, i.e., H_2O_4 or $(HO_2)_x$, which can be formed during the process of ultrasonic irradiation of water.

"The authors are grateful to I. A. Terskov and I. I. Gitel'zon for valuable counsel and guidance in this work."

Contagious Disease

75. Tularemia Relapse Reported

"A Case of Tularemia Relapse," by N. M. Nedosugov, Gor'skaya Oblast Sanitary-Epidemiological Station; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 9, Sep 59, p 129

A tularemia relapse 2 years and 10 months after the primary infection is reported in this article. The case history is given; the condition had been diagnosed as lymphadenitis until a previous history of

tularemia was revealed. Clinical symptoms and the results of serological reactions are described. After 2 weeks of synthomycin therapy (a total of 11 g), the patient was discharged in good condition.

76. Chinese Research Related to Japanese B Encephalitis

"A Study of the *Lasiohelea Taiwana* Shiraki, 1913, Found in Fukien Province," by Chang Pen-hua (張本華), Institute of Parasitology, Chinese Academy of Medical Sciences, and Wang Chun-yuan (王俊元), Fukien Health and Epidemic Control Station; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 1, Feb 58, pp 140-144

This paper presents a study of the morphology and ecology of the blood-sucking fly, *Lasiohelea taiwana* Shiraki, 1913, and a brief discussion of its role in the transmission of B encephalitis.

The author states that attention was first drawn to small blood-sucking flies as possible transmitters of B encephalitis when in 1955 an epidemic in Fukien continued its rampant spread even after the principal mosquito vectors of the virus had been basically exterminated. Subsequently, thousands were collected for study and classification. Over 3,200 were *Lasiohelea taiwana*, a species which is prevalent in Szechwan Province as well as in Taiwan. In 1957, Wu Chiao-ju (吳皎如) and others succeeded in isolating Japanese B encephalitis virus from this insect.

"Study on Methods for the Recovery of Japanese B Encephalitis Virus," by Wu Chiao-ju (吳皎如) and Wu Shu-yin (吳樹吟), Fukien Institute of Epidemiology; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 3, Nov 58, pp 294-297

This paper reports the details of experiments undertaken to evaluate the efficiency of three methods described in Japanese literature for the recovery of Japanese B encephalitis virus. The methods involved artificially infecting white mice with virus-containing material which had been subjected to one of the following treatments: (1) ground and diluted with meat infusion broth, (2) mixed with 4% mucin in meat infusion broth, or (3) passed through chick embryo to increase virulence.

Results showed that, for the recovery of the virus from cow's blood and the insects, *Lasiohelea taiwana* and *Aedes albopictus*, inocula prepared by the last two of the above-mentioned methods gave good results. In fact, there are the only methods by which the Japanese B encephalitis virus has been successfully recovered from the blood-sucking gnat, *Lasiohelea taiwana*, the authors say.

The work reported in the above paper was conducted in 1957 as part of a research project on insect vectors and animal hosts of Japanese B encephalitis virus.

"An Improved Complement-Fixation Test for Japanese B Encephalitis," by Chou Ming-hsien (周明先), Wang Chin (王瑾), and Huang Chen-hsiang (黃禎祥), Department of Virology, Chinese Academy of Medical Sciences; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 1, Feb 58, pp 58-65

The authors describe an improved complement-fixation test which, when applied to the sera of 397 patients suspected of Japanese B encephalitis, gave 112 positive results as compared with only 75 positives obtained by applying the original method to the same 397 specimens. Serum antibody titers of positive sera were 2-4 times higher by the improved method than by the original method. Moreover, positive reactions were observed earlier in the course of the disease by the improved method.

The improved complement-fixation test follows the original procedure, but the whole experiment is performed in an ice tray at 2-4 degrees centigrade so as to avoid inactivation of complement and antigen due to changes in temperature. Fixation in the refrigerator is also prolonged from 18-20 hours to 40-42 hours.

"A Strain of Japanese B Encephalitis Virus With High Subcutaneous Lethality for White Mice -- the Ching Wei Yen₁ Strain, and Its Comparison With the Pathogenicity of the Nakayama Strain," by Huang Chen-hsiang (黃禎祥) and Chou Ming-hsien (周明先), Department of Virology, Chinese Academy of Medical Sciences; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 1, Feb 58, pp 32-35

This paper reports white mouse experiments undertaken to compare the pathogenicity of the Ching Wei Yen₁ (京衛研) strain of Japanese B Encephalitis virus with that of the Nakayama strain. Both

strains are preserved in the dry state in the authors' laboratory. The former was isolated in Peiping in 1949 and had undergone 31-35 mouse passages. The latter, originally from Japan, was obtained from Hammond in the US without data on previous passage and subsequently passed through mice 68-73 times at the authors' laboratory.

Results of the experiments showed a great difference in pathogenicity between the two strains when inoculated peripherally, but no remarkable difference when inoculated intracerebrally. For 3-week-old white mice, the LD₅₀ of the Ching Wei Yen₁ strain when given intraperitoneally or subcutaneously was 10^{-8.3}; that of the Nakayama strain was 10⁻⁴ intraperitoneally and 10⁻² subcutaneously.

The practical value of finding a strain with high peripheral pathogenicity is discussed. But further research to determine whether the lower pathogenicity of the Nakayama strain is due to variation resulting from prolonged mouse passages is indicated.

"The Stability of Japanese B Encephalitis Virus Under Various Temperatures," by Liu Yuan-yuan (柳元元), Chou Ming-hsien (周明先), and Li P'ei-chun (李佩筠), Department of Virology, Chinese Academy of Medical Sciences; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 1, Feb 58, pp 53-57

This item reports studies on the thermo-stability of the Ching Wei Yen₁ strain of Japanese B encephalitis, which was isolated in Peiping in 1949. Ten percent virus suspensions were made from infected mouse brain tissue by using skim milk or a specially prepared lactose-salts solution, and stored at minus 15 to minus 18 degrees or 2-4 degrees centigrade, some with and some without previous lyophylization. The stored material was examined periodically for changes in infective titer. It was found that there was almost no change in the infective titer of the lyophylized material after 2 years' storage at minus 15 to minus 18 degrees centigrade, and only a slight drop after one year's storage at 2-4 degrees centigrade.

"Report on Survey of B Encephalitis Viremia and Unapparent Infection Among Yellow Cattle," by Wu Chiao-ju (吳 皎 如) and Wu Shu-yin (吳 樹 吟), Fukien Institute of Epidemiology; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 7, No 1-2, May 59, pp 40-41

This paper, which was received for publication on 25 April 1958, reports the details of a serological study of domestic cattle to determine whether B encephalitis viremia and unapparent infection occurs in cattle just before the outbreak of a human epidemic. The study was conducted during "the current year" in a region in Fukien Province where the disease becomes highly endemo-epidemic.

Blood specimens from 7 out of 36 cattle produced signs of encephalitis in experimental mice on first inoculation, but the virus was lost in subsequent attempts at mouse passage, except in one case where the infected mouse brain was treated with mucin broth. Serological tests showed the existence of viremia and unapparent infection among cattle. From these results, the authors conclude that domestic cattle are sources of infection in Fukien Province.

"A Study of Natural B Encephalitis Infection Among Chickens," by Wu Chiao-ju, Wu Shu-yin, and Chang Hua-chieh (張 華 杰), Fukien Institute of Epidemiology; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 7, No 1-2, May 59, pp 43-47

This paper reports experiments undertaken in 1954 and 1955 during which three strains of encephalitis virus were isolated from the brains of chickens succumbing to an epizootic, which was at the time believed by some to be of New Castle disease. The outbreak occurred simultaneously with an endemo-epidemic of human Japanese B encephalitis in an unspecified part of Fukien Province. The viruses were identified biologically and serologically as B-type encephalitis indistinguishable from those recovered from patients in that area.

The authors say that during a survey of the animal reservoirs of B encephalitis, which was conducted in an endemo-epidemic area of Fukien in 1957, chickens were found to have had recent unapparent infection. The possibility of *Lasiohelea taiwana* as the principal insect vector of the disease among chickens is discussed.

Epidemiology

77. Epidemiology of Q Fever

"The Role of Wild Rodents in the Epidemiology of Q Fever," by N. N. Sterkhova and M. G. Akhundov, Azerbaydzhan Institute of Epidemiology, Microbiology, and Hygiene; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 9, Sep 59, pp 124-125

This article reports an outbreak of Q fever in Baku in 1956, with sporadic cases occurring in other areas of the republic. The first focus of infection was in Apsheron, where the disease was diagnosed among humans and agricultural animals (goats, sheep, and buffalos) by serological and virological tests. Infected Ixodes ticks (*Hyalomma plum. plum.* and *Rhipicephalus sanguineus*) and several species of infected rodents were found.

The data obtained in tests on rodents confirmed that *Meriones persicus* Blanford, *Meriones erythourus* Gray, and the gray rat can be infected; the presence of a natural focus of the disease was substantiated. The gray rat is considered a possible natural reservoir of Q fever.

78. Tick-Borne Encephalitis and Two-Wave Meningoencephalitis Identical

"Nosological Independence of Two-Wave Viral Meningoencephalitis," by G. L. Khasis, Chair of Faculty Therapy and Chair of Nervous Diseases, Orenburg Medical Institute; Moscow, Klinicheskaya Meditsina, No 9, Sep 59, pp 38-47

The author of this article states that a careful study of epidemiological, clinical, pathomorphological, and other characteristics of two-wave meningoencephalitis and tick-borne encephalitis showed that there is no difference in the natures of both diseases. Consequently, no basis exists for giving two-wave meningoencephalitis an independent nosological classification. According to the author's data, two-wave meningoencephalitis is only a clinicoepidemiological variation of tick-borne encephalitis. The results of investigations also do not provide a basis for considering two-wave meningoencephalitis as an independent clinical form since its clinical picture is identical with the meningeal syndrome of tick-borne encephalitis. The author of this article believes that the artificial breakdown of already well-known diseases in humans brings about terminological confusion in the nosological classification of infectious diseases.

Immunology and Therapy

79. Purification of Antiplague Serum

"Purification and Concentration of Antiplague Serum by the Use of Magnesium Sulfate," by P. A. Shershnev, Irkutsk Scientific Research Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 9, Sep 59, p 131

The objective of the research described in this brief author's summary was to test magnesium salts for precipitating globulin fractions of antiplague sera. The methodology of purification and concentration consisted of removing the albumin fraction from the serum by precipitating the globulins with crystalline magnesium sulfate (70%) and subsequent dialysis. Eight antiplague sera obtained from producers after 2, 8, 14, and 18 cycles were used.

The preventive properties of the purified sera were tested on mice and rabbits which had been infected with 10 Dlm of a virulent B. pestis culture. The anaphylactogenic and pyrogenic properties of the sera were also tested on rabbits.

The experiments showed that this method of purification and concentration increased the content of the gamma-globulin fraction of antiplague serum by 60-70% and decreased the content of ballast proteins (albumins) by 5-6%; the purified sera had a less pronounced anaphylactogenic effect than natural sera, and their pyrogenicity did not exceed the established standards. The purified serum was made more than three times as effective; it was therefore possible to decrease the therapeutic dosage.

Industrial Hygiene

80. Vibration Sickness Described

"The Clinical Picture of Vibration Sickness," by E. A. Drogichina and N. B. Metlina, Institute of Labor Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Klinicheskaya Meditsina, No 9, Sep 59, pp 104-110

After stating that the extent of the biological action of vibration on the human organism is dependent on its amplitude and frequency ranges, the authors of this article describe the clinical picture of vibration sickness and the prospects for its treatment and prevention. Four stages

of vibration sickness are delineated. The severity of the pathological process depends not only on the duration and force of the vibration, but also on the sensitivity of the organism to it. Some industrial establishments have taken the lead in seeking satisfactory preventive measures: the methods of diagnosis and active therapy which are currently in use have acquired special significance in preventing the development of pronounced forms of vibration sickness.

81. Use of Oxygen in Industry

"The Prophylactic Use of Oxygen in Industry," by Prof Kh. Vaynshteyn, Chelyabinsk; Moscow, Meditinskiy Rabotnik, No 69 (1817), 28 Aug 59, p 3

This article states that oxygen starvation, or hypoxia, may arise as a result of some morbid condition of the respiratory organs such as pulmonary fibrosis, pneumonia, emphysema, exudative pleurisy, etc. Hypoxia may be caused by hypertension, atherosclerosis, stenocardia, severe intoxication, and loss of blood. Oxygen starvation may produce metabolic disturbances and reactions in the central nervous system, the respiratory organs, the cardiovascular system, the liver, and other organs. Oxygen starvation may be the source of headaches, decrease in appetite, and insomnia.

The author of this article continues that the administration of oxygen has proved very beneficial when used in the treatment and prevention of the above-mentioned morbid conditions. It has been shown that oxygen acts as an analgesic in cases of neuralgic pains, angio-spasms, diabetes mellitus, and hypertension.

There was a time when oxygen was administered only if the patient were in very serious condition. It has been demonstrated that oxygen should be administered as soon as possible in conjunction with other therapeutic drugs. This makes it possible to prevent complications and to reduce dyspnea, weakness, headaches, and pain in the heart.

Oxygen has been widely used in preventing occupational diseases in coal mining and in chemical, metallurgical, and some other branches of industry. Oxygen was used more extensively after it was found that the presence of large quantities of dust in the air, vapors and gases of various acids, carbon monoxide, etc. could cause hypoxia among workers.

Breathing air containing vapors of sulfuric acid, guaiacol benzoate, ether, and coal particles may cause headaches, muscular pain, insomnia, catarrh of the respiratory tract, and changes in the skin. A decrease

in the index of oxygen saturation may cause neuritis, dermatitis, myositis, pneumoconiosis, silicosis, and other diseases of the lungs. Disturbances in respiration, circulation, and metabolism may arise as a result.

The great effectiveness of oxygen in cases of chronic occupational diseases lies in the fact that its increased content in the blood produces a reaction, through the interoceptors of the lungs, on the regulating function of the central nervous system and, consequently, on metabolism.

In view of the beneficial properties of oxygen, the author of this article deemed it expedient to use it as a preventive measure during the early stages of such occupational illnesses as headaches, neuralgia, decreased appetite, coughing, insomnia, skin irritation, etc. Initial experiments with oxygen were begun 4 years ago on workers in varnish, dye, and chemical factories.

Workers were given oxygen (60% concentration) for a period of 45 minutes at the end of their shift. This was continued for a period of 15-20 days. Each worker undergoing oxygen therapy was examined three times: before, and 8-10 days and 15-20 days after the first treatment. A chart kept for each worker showed that in all cases headaches decreased or disappeared entirely, the feeling of weakness passed away, appetite and sleep improved, and arterial pressure dropped in all cases in which hypertension was originally present. The same results were noted in locomotive engineers of a coal-tar chemical plant who were working under high-temperature conditions and in an atmosphere saturated with dust and gases. A course of treatment with oxygen had a beneficial effect on the health of workers in a thermal-electric center, the coal transport industry, and a zinc factory.

The administration of oxygen to prevent occupational diseases among workers in various industrial establishments is now widely used not only in Chelyabinsk, but also in other cities of Chelyabinskaya Oblast: Magnitogorsk, Zlatoust, Kopeysk, Satka, and Yemanzhelinsk. Since industrial oxygen is prepared in the same manner as medical oxygen, it is safe to use it in the same manner and under the same circumstances as medical oxygen.

The attention of medical workers must be directed toward the investigation of the effects of new technological processes, automatics, and electronics on the health of workers. Studies must be inaugurated

to determine the effects of new chemical substances, radioisotopes, ultrasound, and high-frequency fields of various noises and vibrations on the health of workers in various industrial establishments.

There is no doubt that oxygen possesses natural biological properties and that it produces a favorable effect on the central nervous system and on metabolism. Workers of first aid units and chief specialists of health departments must actively publicize the preventive properties of oxygen. Extensive preventive medical measures undertaken in various industrial establishments are in line with the plan for developing the national economy during the next 7 years.

Oncology

82. Testosterone Acetate -- a Cancerogenic Agent

"Cancerogenic Action of Androfort (Testosterone) Acetate)," by G. Kendrey, J. Balo, and J. Juhasz, Kiserl. orvostud (Hungary), 1957, 9, No 5-6, 531-536 (from Referativnyy Zhurnal -- Biologiya, No 14, 25 Jul 59, Abstract No 64558, by A. N. Ivanov)

CPYRGHT

"Androfort (testosterone acetate) was intraperitoneally administered to mice (34) for a period of 17 weeks. Each mouse received 16.5 milligrams of androfort. Eleven months after the experiment was begun the mice were killed. Subpleurally situated adenomas could be seen with the unaided eye in five of the animals. Four of the animals had enlarged livers, spleens, and lymphatic nodes with a characteristic microscopic picture of lymphoid and myeloid leukemia. Histological examinations of 40 control mice revealed lymphoid leukemia in only one animal. Most of the researchers who experimented with testosterone received negative results. This is explained by the fact that the histological examinations were carried out usually 3-4 months after the beginning of the experiments."

83. Antibiotic Therapy of Sarcoma

"On the Effect of the Active Substance of the Actinomycetes Fungus on the Development of Sarcoma in Rats," by Z. A. Sotskaya, Sb. Nauchn. Rabot Zaporozhsk. in-ta Usoversh. Vrachey (Collection of Scientific Works of the Zaporozh'ye Institute for the Advanced Training of Physicians), 1958, No 1, 32-33 (from Referativnyy Zhurnal -- Biologiya, No 14, 25 Jul 59, Abstract No 64641, by N. A. Blumberg)

CPYRGHT

"The antibiotic substance obtained from the cultural liquid of actinomycetes No 324 (exhibiting activity in relation to gram positive as well as in part to gram negative bacteria and Candida fungi) was used on rats afflicted with Sarcoma M-1. The dry preparation of the antibiotic substance is a powder, yellow-brown in color, and readily soluble in water. Its lethal dose for rats when subcutaneously administered is 1,500 milligrams per kilogram of body weight. Therapy of the animals began on the second day after they were inoculated with the tumor. The antibiotic substance in doses of 0.5 milliliter of 0.1 percent solution was injected into the animals twice every 24 hours for a period of 10 days. Observations were continued for a period of 1 1/2 months. The effectiveness of the therapy was evaluated on the basis of the size of the tumors (nine experimental rats and seven control). On the basis of the preliminary data, the antibiotic substance had considerable inhibitory effect on the growth of rat sarcoma M-1."

84. Radiation Therapy of Cancer

"New Method of Standardization for the Radiation Therapy of Cancer," by E. Ungar, Neoplasma (Czechoslovakia), 1959, 1, 82-92 (from Meditinskiy Referativnyy Zhurnal, Razdel II, No. 9, Sep 59, p 64)

CPYRGHT

"Radiation therapy through the use of improved apparatuses and large doses of radioactive isotopes has as yet failed to cure most of the local foci of tumors. The standardization of these methods is necessary for the experimental and clinical study of the action of radiation. Three standard types of arrangements for three, six, and four fields of irradiation which, from a theoretical viewpoint, will maximally spare the tissue surrounding the tumor have been proposed. Schemes for roentgenotherapy which will make it possible to take into consideration the individual characteristics of each case will be developed in regard to the 18 basic tumor localizations. Such a scheme has already been developed by the author in relation to cancer of the epiglottis."

85. Cobalt Therapy of Cancer of the Uterus

"Application of Cobalt-Containing Pellets for the Therapy of Cancer of the Corpus Uteri," by F. Vandor Mag. lapja (Hungary), 1959, 1, 1-3 (from Meditinskiy Referativnyy Zhurnal, Razdel III, No 10, Oct 59, pp 38-39)

CPYRGHT

"The author proposes the use of a new type of cobalt-containing pellets for the therapy of cancer of the corpus uteri. The pellets are prepared from Danamid, a plastic material produced in Hungary. Radioactive cobalt having an intensity of 3.4 mC is placed in the cavities of the pellets which are 3.5 by 3 millimeters in size. The openings of the pellets are hermetically sealed with plastic stoppers. The pellets are joined at the sides by threads. A roentgenological examination to determine the size and form of the uterine cavity is made before therapy is begun, and on the basis of the examination the proper number of pellets for the uniform and complete irradiation of the uterine cavity is selected. A bibliography contains 11 references."

Pharmacology and Toxicology

86. Ganglioblocking Preparation

"Nanophyn," by A. T. Chernyayeva, Materialy po Obmenu Peredov. Opytom i Nauchn. Dostizh. v Khim-Farmatsevt. Prom-sti (Data of the Exchange of Advanced Experiments and Scientific Achievements in the Chemicopharmaceutical Industry), 1958, No 1/12, 58-61 (from Referativnyy Zhurnal -- Khimiya, No 15, 10 Aug 59, Abstract No 54431, by A. Vavilova)

CPYRGHT

"Nanophyn, the hydrochloride of 2,6-dimethylpiperidine (I), has a melting point of 285-290 degrees; it is soluble in water and alcohol and insoluble in ether and acetone. It lowers blood pressure and has a blocking effect on the vegetative ganglia. It is slightly toxic. The initial material for the synthesis of (I) is 2,6-lutidine- (2,6-dimethylpyridine), isolated from a coal fraction when boiled at a temperature of 140-145 degrees. A description of the technological process in stages is given: the isolation of 2,6-lutidine from beta-picolinic fraction; and derivation of (I). The basic waste products in the synthesis of (I) are Zn-complex of gamma and beta-picolines which may be utilized in the production of isonicotinic and nicotinic acids; and NaOH used for the subsequent separation of lutidine. The harmful phases in the production of (I) are indicated."

87. Elatine -- a Curarelike Alkaloid

"Elatine," by A. D. Kuzovkov, Materialy po Obmenu Peredov. Opytom in Nauchn. Dostizh. v Khim-Farmatsevt. Prom-ti (Data of the Exchange of Advanced Experiments and Scientific Achievements in the Chemicopharmaceutical Industry), 1958, No 1/12, 155-158 (from Referativnyy Zhurnal -- Khimiya, No 15, 10 Aug 59, Abstract No 54441, by A. Vavilova)

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"Elatine is a curarelike alkaloid effective in the therapy of diseases of the nervous system which are accompanied by a pathological rise in the muscular tonus; it is active whether administered intravenously or introduced into the stomach. Elatine is a crystalline powder with a melting point of 222 degrees (diffused) and 233-237 degrees/0.1 to 20 millimeters (nondiffused). Elatine is a weak base, practically insoluble in water and kerosene; it is soluble in chloroform and chlorethane and may be recrystallized from alcohol. The raw material from which elatine is obtained is the plant *Delphinium elatum* L. (the roots contain 0.2 percent and the leaves 0.17 percent of elatine). The solubility of elatine sulfate and the insolubility of "eldeline" sulfate (both are contained in the plant) in chloroform makes it possible to separate the two alkaloids. A detailed description of the derivation of elatine is given. The medicinal form of elatine is a tablet (Z. I. Brykov) which is prepared according to the following formula (in grams): elatine -- 0.01; powdered sugar -- 0.038; starch -- 0.051; and Ca stearate -- 0.001. The tablets are to be kept under lock and key (list A)."

88. Effect of Cholinergics on the Organism

"The Mechanism of the Action of Some Cholinergic Drugs on Animal Organisms, by Ye. Yurisson, Sb. Nauchn. Tr. Est. s.-kh. Acad. (Collection of Works of the Estonian Agricultural Academy), 1958, No 5, 238-245 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 59, Abstract No 77681, by the author)

CPYRGHT

"Proserine (I) strongly stimulates, and ditilin (II) and diplacin (III) depress the motor activity of the intestines. (I) in therapeutic doses completely inactivates, and (II) diminishes the activity of the cholinesterase in the intestines and the blood serum. (II) and (III) have different effects on the motor activity of the intestines; in weak concentrations, (II) intensifies intestinal contractions; in stronger concentrations, (II) depresses intestinal activity. (III) in any concentration depresses intestinal motor activity. (I) is antagonistic to (III), but in relation to (II) it is partially synergic and partially antagonistic."

89. Toxicology of Some Anthraquinone Amines and Other Substances

"Toxicological Characteristics of Some Anthraquinone Amines and Chlorinated Nitroanilines," by M. P. Slyusar, Uch. Zap. Ukr. n.-i. In-t Gigiyeny Truda i Profzabolevaniy (Scientific Notes of the Scientific Research Institute of Labor Hygiene and Occupational Diseases), 1958, 27, 106-108 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 13, 25 Jul 59, Abstract No 17746, by R. Khaunina)

CPYRGHT

"A toxicological evaluation of 1-aminoanthraquinone (I), 2-aminoanthraquinone (II), 4-chlor--2-nitroaniline (III), and 2,6-dichlor--4-nitroaniline (IV) based on the investigation of blood, urine, weight, and the histomorphology of internal organs is given. (I) and (II) are volatile substances which vaporize under specific conditions. (II) is more toxic than (I). An increase in the quantity of free and combined phenols in the urine indicates the presence of (I) in the organism. (II) is not transformed into phenol containing products and has cumulative properties. (III) and (IV) are products which do not vaporize readily. (III) is somewhat more toxic than (IV); the latter, however, produces a more expressed loss in weight than that produced by (III). A possible indication of the presence of (III) in urine is an increase in free and combined phenols. (IV) is not excreted in the form of phenols."

90. Influenza Therapy

"Cutisone," by M. N. Shchukina, Materialy po Obmenu Peredov. Opytom i Nauchn. Dostizh. v Khim.-Farmatsevt. Prom-sti (Data on the Exchange of Advanced Experiments and Achievements in the Chemicopharmaceutical Industry), 1958, No 1/12, 52-54 (from Referativnyy Zhurnal -- Khimiya, No 15, 10 Aug 59, Abstract No 54422, by A. Vavilova)

CPYRGHT

"Cutisone (I) -- the thiosemicarbazone of p-isopropylbenzaldehyde (II) (cumic aldehyde) -- is used in the therapy of virus influenza. (I) is a crystalline powder with a melting point of 147-148 degrees; when heated, it is readily soluble in methyl, ethyl, and isopropyl alcohols, acetone, chloroform, dichlorethane, dioxane, benzene, ethyl acetate, and glacial acetic acid; it dissolves with difficulty in CCl_4 , and is almost insoluble in ether, petroleum ether, and water. (I) is obtained through the interaction of (II) and thiosemicarbazide for one hour in an aqueous-alcohol medium at a temperature of 70-75 degrees, and the recrystallization of the technical (I) from the alcohol to which carbon is added. It was practically established that for the derivation of (I) it is necessary to use redistilled (II) containing, through the oxime formation method, 87-90 percent of "conditioned (II)". This process, when assayed by the prescribed method with thiosemicarbazone, yields about 90 grams of recrystallized (I) from each 100 grams of (II). The technological process of the derivation of (I) is described, and safety measures when handling the latter are indicated."

91. Antihistamine and Spasmolytic Drug

"Aethyzine," by N. G. Preyn, Materialy po Obmenu Peredov. Opytom i Nauchn. Dostizh. v Khim.-Farmatsevt. prom-sti (Data on the Exchange of Advanced Experiments and Scientific Achievements in the Chemicopharmaceutical Industry), 1958, No 1/12, 102-104 (from Referativnyy Zhurnal -- Khimiya, No 15, 10 Aug 59, Abstract No 54428, by A. Vavilova)

CPYRGHT

"Aethyzine, the hydrochloride of 10-(dimethylaminoethyl)-phenothiazine (I), is an antihistamine, spasmolytic preparation analogous in its effect to dimedrol. It is used in the therapy of various allergic diseases. (I) is a white crystalline substance, having a melting point of 219 degrees; it is soluble in alcohol and water; insoluble in ether and benzene. (I) is manufactured in tablet form containing 0.025-0.05 grams of the drug, and in ampoules containing 5-10 milliliters of a 5-percent solution of the preparation. It is kept in orange colored, hermetically sealed vessels and in ampoules, in a dry and cool place, protected from the sun and with safety precautions (list B). The hydroxide of (I) is synthesized by the condensation of phenothiazine (II) with the hydrochloride of dimethylaminoethyl chloride in the presence of NaOH in toluene. The hydroxide yield from phenothiazine is 69-73 percent. The yield of the pharmacopeia hydrochloride of (I) from phenothiazine is 73 percent. Waste products -- solid type precipitates which remain after the distillation of dichlorethane and the hydroxide of aethyzine -- are not used. The synthesis of (I) is carried out in well-ventilated quarters to prevent the development of the toxic symptoms which are induced by preparations of the phenothiazine series."

92. Antispasmodic Drug

CPYRGHT "Experimental Investigation of the Antispasmodic Action of the Hydrochloride of the Diethylaminoethyl Ester of Benzilic Acid," by R. Brosteanu and I. Stoica, Studii si cercetari neurol. Acad. RPR (Rumania), 1958, 3, No 4, 431-438 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 59, Abstract No 77645, by the authors)

"The effect of the hydrochloride of the diethyaminioethyl ester of benzilic acid administered in gradually increasing doses up to lethal was studied in cats. The large range of action between the therapeutic (a rise in the threshold of the spasmodic effect of an electric current) and the toxic doses was noted."

93. Vascular and Metabolic Reactions to Aminazine

CPYRGHT "Dynamics of Vascular Reactions and Some Metabolic Manifestations in Therapy With Aminazine," by T. Ya. Dzhaparidze, Sabchota Meditsina (Georgia), 1958, No 6, 15-16 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 59, Abstract No 77576, by the author)

"The effect of aminazine on 50 patients (30 suffering from schizophrenia, and the rest suffering from manic-depressive and reactive psychoses) was studied. The dependence of the reaction of the organism to aminazine on the form and duration of the disease and on the organism's resistance to the drug was noted. In the majority of the patients, blood pressure gradually decreased until it became stabilized. Hyperthermic crises of brief duration developed in some of the patients; these were usually followed by a considerable improvement in the psychic state of these patients. In the author's opinion, some adiposis, a rise in the sugar curve within the high norm limits, and decreased respiration indicate an accumulation of metabolic energy resources."

94. Pentamidine Therapy of Kala-Azar

"The Effectiveness of the application of Pentamidine in the Therapy of Kala-Azar," by Ch'eng Tse-da, Chung-hua I-hsueh Tsa-chih (National Medical Journal, China), 1956, 42, No 11, 1053-1057, (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 59, Abstract No 77903, by Sun Bay-wei)

CPYRGHT

"Sixteen patients suffering from kala-azar were treated with pentamidine following unsuccessful therapy with an antimony preparation. Pentamidine was administered intramuscularly to eight of the patients in single doses of 3-4 milligrams per kilogram of body weight (total dose 2.5-4.0 grams) for a period of 10-20 days, and to the other patients for a period of 39-53 days (total dose 4.7-5.6 grams). Seven patients recovered; therapy was ineffective in eight patients; one died. Greatest effectiveness of the therapy was exhibited in the second group. Side effects included: headaches, tachycardia, dyspnea, poor appetite, nausea, vomiting, and pain at the point of infection. Diabetes of brief duration developed in two of the patients, and cylindrical epithelial cells were found in the urine of five of the patients."

95. Forensic Toxicology Problems

"Contemporary Forensic Toxicology Problems," by K. Kac1, Casop. lek. cesk (Czechoslovakia), 1958, 47, 1482-1488, (from Meditsinskiy Referativnyy Zhurnal, Razdel IV, No 5, May 59, p 68)

CPYRGHT

"A report on the activity of the Laboratory of Toxicology and Forensic Chemistry for 1956 and 1957 is given. The laboratory is continuing the activities of the former Institute of Forensic Chemistry, Toxicology, and Microscopy. The laboratory has developed two new methods for the determination of barbiturates (chromatographic and oscillographic), solved the problem of the simultaneous quantitative determination of arsenic and antimony, and developed a method for the determination of drugs in tablet form for forensic medicine evaluation. A total of 195 analyses were made in 1956 and 236 in 1957. Analyses were made for the entire territory of Czechoslovakia, with those carried out for the provinces making up about two thirds of the total. The laboratory data revealed that of all the types of intoxication, those resulting from the use of barbiturates predominated. While between 1945 and 1950 intoxication resulting from the use of barbiturates constituted about 10 percent of the total number of intoxications, between 1951 and 1955 they rose to 15 percent, and in 1957 to 21.7 percent. Particular attention is being paid to intoxications of children caused by the use of drugs. A future plan for research work in which particular attention will be given to the investigation of the metabolism and toxicity of synthetic and natural substances is outlined. The work of the laboratory will be concentrated first of all on the development of standard analytical methods for the identification of the more frequently encountered poisons (barbiturates, carbon monoxide, and others)."

96. Chinese Test Bacteriostatic Activity of Usnic Acid

"Usnic Acid, an Antibiotic Substance Isolated From Chinese Lichens, by Liu Shu-hsun et al, Institute of Materia Medica, Academia Sinica; Peiping, K'o-hsueh T'ung-pao (Scientia), No 16, 1959, 26 Aug 59, pp 527-528

This article reports the physical and chemical properties of usnic acid isolated from Chinese lichens of the genres Usnea and Cladonia. Its antibiotic effect on specific microorganisms in vitro was determined by titration.

It was found that the same minimal effective concentration (3.1 mg per ml) was required to inhibit the growth of several different strains of Staphylococcus aureus 209 P, namely, a streptomycin-resistant strain, an erythromycin-resistant strain, and a nonresistant strain. The minimal effective concentrations in milligrams per milliliter with respect to other microorganisms were as follows: Xanthomonas citri, 12.5; Myobacterium 607, 25; Pseudomonas aeruginosa, 50; Sarcina lutea, 0.1; Bacillus subtilis, 0.1; Bacillus mycoides, 0.1; and Escherichia coli, 100.

97. Hungarian Pharmaceutical Research

"Concerning Pharmaceutical Research" by Academician Bela Issekutz; Budapest, Magyar Tudomány, Jul/Aug 59, pp 399-403

The article is a general review of pharmaceutical progress from superstition to controlled research, with special emphasis on the development of organotropic medicines and "magic bullets" in the Ehrlich sense. About half way through the article the author turns to Hungarian research:

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"...The further development of our pharmaceutical industry depends on an intensive cultivation of pharmaceutical research. For this reason, our government established the Pharmaceutical Industry Research Institute, which has the job of preparing the domestic manufacture of medicines proven abroad and of perfecting manufacturing techniques, and the Pharmaceutical Research Committee of the Hungarian Academy of Sciences was established to guide and coordinate pharmaceutical research in the various universities and research institutes....

"In the first 10 years after the liberation, we made real progress in producing new medicines. For example, in the Budapest Pharmacology Institute and in the Pharmaceutical Research Department of the Experimental Medical Sciences Research Institute, Karoly Nador produced several hundred quaternary ammonium- and amino-ketone compounds which were systematically examined. Several new, important medicines were discovered and tested in controlled clinical tests here and abroad....

"If we want to maintain our position in the world market we must provide more facilities for research...."

Physiology

98. Ascorbic Acid Increases Animal Resistance to Cold

"The Age of an Animal and Its Biochemical Mechanisms for Adaptation to Cold," by M. F. Merezhinskiy, Materialy Nauchn. Sessii. Posvyashch. 40-Letiyu BSSR (Data From the Scientific Session Commemorating the 40th Anniversary of the Belorussian SSR); Minsk, 1958, pp 165-166 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 19, 10 Oct 59, Abstract No 25701, by I. El'man)

CPYRGHT

"It was established in experiments on white rats that the adaptation of animals to low temperature depends on the extent of the biosynthesis of ascorbic acid. Rats with a high content of vitamin C in their tissues were more resistant to low-temperature conditions. The frequency of the disadaptation phenomenon increased in proportion to the age of the animals. Simultaneously, there was a decrease in the concentration of soluble proteins in the liver. The glycogen content decreased less markedly. Also, a higher content of soluble proteins was always observed in the liver in the animals which were resistant to cold than in the animals which were not resistant to cold."

99. Compensation Measures for Ultraviolet Radiation Deficiency in Transpolar Region

"Hygienic Evaluation of Ultraviolet Radiation in the Northwestern Sector of the Transpolar Region," by A. A. Generalov, Military Order of Lenin Medical Academy imeni S. M. Kirov; Moscow, Gigiyena i Sanitariya, No 4, Apr 59, pp 18-24

Since one of the important factors of the external environment having vital significance for the human organism is solar energy, especially its ultraviolet radiation portion, this research was conducted in the transpolar region where solar energy is meager for much of the year.

Meteorological data for 1954-1956 (Murmansk observation point) and data on the intensity of ultraviolet radiation falling perpendicular to a surface in relation to the height of the sun at various latitudes are presented.

The author presents the following conclusions:

CPYRGHT

"1. The intensity of ultraviolet radiation and its daily amount in various areas in the far northern latitudes were found to be lower than in the southern latitudes.

CPYRGHT

"2. The northern sun is 2-4 times weaker than the southern sun with regard to its biological effect.

"3. The unfavorable meteorological factors of the transpolar region strongly reduce ultraviolet radiation and somewhat limit the possibility of the inhabitants' using the wholesome properties of the northern regions.

"4. Regardless of the unfavorable climactic conditions, the amount of ultraviolet radiation in the transpolar region during the summer and partly during the spring-fall season is quite significant and has a definitely marked biological effect.

"5. During the summer, and partly during the spring and fall, the inhabitants of the transpolar region, under ordinary living and working conditions, are able, in a comparatively short time out of doors, to obtain the prophylactic dose of ultraviolet rays required for the organism.

"6. In the far northern latitudes, during the winter, due to the complete or prolonged lack of natural ultraviolet radiation and also due to its lower value in summer time, as compared with points lying in the middle and southern latitudes, it is necessary to compensate for this deficiency by irradiating the people in a 'photarium' or by a method of introducing sources of ultraviolet radiation into the general system of illumination."

100. Morphological Changes in Dogs due to Abrupt Pressure Changes

"Morphological Changes due to the Effect of Changes in Atmospheric Pressure Under Experimental Conditions," by V. I. Nikolayeva; Moscow, Arkhiv Patologii, Vol 21, No 2, 1959, pp 28-31

A morphological study was conducted on ten dogs to determine the nature of injuries caused by the effect of abrupt (within $1\frac{1}{2}$ seconds) changes in barometric pressure; the extent to which these changes endangered the lives of the experimental animals was also studied.

CPYRGHT The author presents the following conclusions:

"1. Acute peripheral vesicular emphysema, foci of atelectasis, plethora of the pulmonary tissues, and sometimes mild subpleural perivascular hemorrhages occur in the lungs of dogs under the effect of changes in barometric pressure from 424 to 56 mm Hg if oxygen under pressure is provided for their respiration and a counterpressure is applied against their bodies.

"2. The elasticity of the lung framework is not subjected to any significant changes, with the exception of rupture of certain filaments in the alveoli which have expanded due to emphysema. The elasticity of the blood vessels and bronchi remains unchanged. A certain amount of inequality in the argyrophyl impregnation of the membrane can be detected.

"3. Circulatory disturbances not sharply pronounced were noted in the central nervous system, myocardia, liver, kidneys, and the gastrointestinal tract.

"None of these changes endangered the lives of the experimental animals. Even in dogs which were subjected to pressure changes five or six times, there was no evidence of pulmonary tissue rupture or of any significant hemorrhage in the vital organs."

101. Chinese Experiments Support Reflex Mechanism Theory of Tetanus

"Investigations on the Pathogenesis of Tetanus I. The Effect of Cocaine Block on the Occurrence of Tetanus," by Yao Chun-shen (姚君慎), Department of Morbid Physiology, Tsingtao Medical College; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 3, Aug 58, pp 316

This paper reports the details of controlled rabbit experiments conducted to test by a "new" approach the validity of the "as yet not widely accepted" theory that tetanus develops by reflex mechanism. The new method provided prolonged peripheral stimulation by a semisolid preparation of tetanus toxin without the diffusion of the toxin into the nerve trunk. Preliminary results obtained definitely supported the theory, the author says.

The significance of the new method and the results obtained are discussed.

Radiology

102. Ratio of Methionine to Tyrosine Changed in Proteins of Irradiated Rats

"The Problem of the Characteristics of Protein Synthesis in Organoids of the Cells of Normal Tissues and Tissues of Irradiated White Rats," by L. I. Il'yina and R. V. Petrov; Moscow, Tsitologiya, Vol 1, No 3, May/Jun 59, pp 289-292

It has been shown that there are qualitative and quantitative changes in the protein composition of various cellular proteins under the effect of acute radiation sickness. This research is a further study of the ratio of the two amino acids (i. e., tyrosine with C^{14} and methionine with S^{35}) in the proteins of cellular nuclei, mitochondria, microsome, and hyaloplasm of the liver and of the mucous membrane of the small intestines.

CPYRGHT

The following conclusions are presented:

"1. The ratio of S^{35} -methionine to C^{14} -tyrosine in the total proteins of the organoids of the cells of hepatic tissue and of the mucous membrane of the small intestines of normal rats is characterized by a value of 1.6-3.5.

"2. In acute radiation sickness of white rats, this ratio is practically unchanged in the nuclei, mitochondria, and in the hyaloplasm of the cells of the above-mentioned tissues.

"3. The ratio of S^{35} -methionine to C^{14} -tyrosine in the total proteins of the microsome of the cells of both tissues is changed sharply during radiation sickness. In the irradiated rats, this ratio is characterized by a value of 0.7 in the liver and 0.9 in the mucous membrane of the intestines."

103. Effect of Citrate Level on Rate of Polonium Excretion Through the Kidneys

"The Role of Endogenous Citrates on Polonium Elimination From an Organism," by A. P. Safronov; Moscow, Biokhimiya, Vol 24, No 3, May/Jun 59, pp 421-424

Experiments were conducted on rabbits to discover any ratio between the citrate level and the amount of polonium eliminated with the urine by the experimental animals.

The methodology is described, and the article presents a table and three graphs which explain the experimental results.

The author concludes that the results show the existence of a correlation between the level of endogenous citrates and the radioactivity level in the urine of rabbits poisoned by polonium. This fact and the well-known capacity of citric acid to form water-soluble derivatives of heavy metals makes it possible to suppose that endogenous citrates affect the excretion of polonium through the kidneys.

104. Morphological Changes in Cerebellum After X-Irradiation

"Morphological Changes in the Nerve Cells of the Cerebellum After Total and Local X-Irradiation of White Mice," by M. I. Sorokina, Laboratory of Radiobiology, Institute of Animal Morphology, Academy of Sciences USSR; Moscow, Tsitologiya, Vol 1, No 4, Jul/Aug 59, pp 374-378

Since scientific literature reveals much controversy on the reaction of the nervous system to the effect of ionizing radiation and on the radio-resistance of the various branches of the central nervous system, the author studied the nature of the morphological changes in the nerve cells of the cerebellum after general and local X-ray irradiation. Special attention was devoted to the tigroid substance of Nissl bodies since it is supposed to be an important specific ingredient of the nerve cells and is connected with the functional condition of the neurone.

CPYRGHT The author presents the following summary and conclusions:

"1. The morphological changes in the cerebellar nervous tissues of fully grown white mice subjected to general and local X irradiation were studied in this research. The general irradiation of the animals was by 400, 700, 1,000, and 5,000 r doses, while the local irradiation of the head was by 700, and 5,000 r doses.

"2. The microscopic study of the nervous tissue of the cerebellum (Purkinje cells, nucleus dentatus, nucleus fastigii, nucleus globosus, and nucleus emboliformis) of the mice that were subjected to whole body irradiation by 400, and 700 r doses showed no morphological changes.

"3. After the total irradiation of the animals by 1,000 and 5,000 r, the following changes were noted in the nerve cells of the cerebellum: vacuolization of the cytoplasm, crenation of the nucleus and of the cell, hyperchromatosis, and tigrolysis. The higher the dose of total X irradiation, the sooner the morphological changes were detected.

"4. After the local irradiation of the heads of the animals by 700, and 5,000 r, no destructive changes could be detected in the Purkinje cells or in the cerebellar nuclei which were tested.

"5. The nervous tissue of the cerebellum possesses a significantly lower radiosensitivity than the motor nuclei of the medulla oblongata."

105. Retention of Radiation Injuries and Protective Effects of Hibernation

"The Problem of the Retention of Radiation Injury in the Epithelial Cells of the Corneas of Frogs Irradiated During Winter Hibernation." by I. B. Bychkovskaya, Division of Experimental Morphology of Central Scientific Research Institute of Medical Radiology, Ministry of Health USSR, Leningrad; Moscow, Tsitologiya, Vol 1, No 4, Jul/Aug 59, pp 387-392

The purpose of this research was to study the effect of oxygen and hypoxia on the radiation effect brought about by the irradiation of animals in a state of hibernation, when metabolism is sharply decreased.

CPYRGHT The author presents the following conclusions:

"1. Morphological changes (the onset of pathological mitosis and the appearance of double- and multiple-nucleated cells) in the corneal epithelium of frogs which have been irradiated during hibernation begin only when the animals awaken. The extent to which radiation injuries are manifested is not changed through retention during hibernation, but their development has been arrested.

"2. Injury to the epithelium of the cornea growing in frogs which are awake after irradiation is found to be significantly less marked if the irradiation is conducted under conditions of hypoxia.

"3. Hypoxia which is produced at the time of irradiating hibernating frogs does not decrease the injury which develops after the termination of hibernation. However, there is a protective effect if hypoxia is produced at the moment the animals awaken from hibernation.

CPYRGHT

"4. It is known that the protective effect of hypoxia is accomplished at the level of primary radiation processes. In connection with this, the experiments which were conducted show that under hibernation conditions, the development of radiation changes is arrested at earlier stages than those stages for which the presence or absence of oxygen in the surrounding environment is essential."

106. Shifts in Adenosinetriphosphatase Activity of Spleen After Irradiation

"Mechanisms for Increasing Adenosinetriphosphatase Activity in the Spleen Under the Effect of Ionizing Radiation," by Ye. A. Prokudina, Experimental Cancer Division, Central Scientific Research Institute of Medical Radiology, Ministry of Health USSR, Leningrad; Moscow, Tsitologiya, Vol 1, No 1, Jan/Feb 59, pp 78-85

The purpose of this research was to explain how the pathogenetic effect of radiation sickness is brought about. A study of the role of the regulatory systems of an organism in changing the ATP-ase (adenosinetriphosphatase) activity was conducted on rat spleens subjected to total body irradiation by a dose of 1,500 r X irradiation.

CPYRGHT The author presents the following conclusions:

"1. After whole-body irradiation of the animals, the rise in ATP-ase activity in the spleen is brought about chiefly by the direct effect of irradiation on the tissue of the organ under investigation.

"2. The increase in ATP-ase activity which is caused by the direct effect of ionizing radiation after whole-body irradiation contributes to the intensity of the hormonal activity of the adrenals of irradiated animals.

"3. The nervous system under conditions of total-body irradiation counteracts the pathogenetic effect of the adrenals by changing the level of ATP-ase activity. The protective role of the nervous system under radiation injury conditions is thereby explained.

"4. Functional shifts in an organism which are caused by the massive radiation effect on the head (4,500 r) lead to a rise in ATP-ase activity in the spleen which was not subjected to the effect of ionizing radiation.

CPYRGHT

"5. The rise in ATP-ase activity after the irradiation of the head has a neurohormonal mechanism; in addition, the adrenals are a necessary link, although their pathogenic effect is fully accomplished only when the innervation of the organ being studied is intact.

107. Effect of Ionizing Radiation on Demyelination Process of Nerve Fibers of Central Nervous System

"Demyelination of the Nerve Fibers of the Central Nervous System Brought About by the Effect of General Ionizing Radiations on Animal Organisms," by A. F. Bibikova; Moscow, Arkhiv Patologii, Vol 21, No 5, 1959, pp 19-24

This research is a histological study of the central nervous systems of dogs in which the development of the demyelination process was the result of a single total X irradiation by a minimum lethal dose of 600 r.

The author discusses the toxic agents and toxic substances which are formed in irradiated tissues and which cause demyelination of nerve fibers. The following conclusions are presented:

CPYRGHT

"The myelin sheaths of the nerve fibers of the central nervous systems are very sensitive to the effect of ionizing radiation.

"The general effect of ionizing radiation on animal organisms is either the acute or chronic (depending on the dose, and on the period of survival after irradiation) development of the demyelination process in the central nervous system.

"The development of the demyelination process at various periods after X irradiation positively proves that the concept of certain non-Soviet authors concerning the resistance of the nervous system to the effect of ionizing radiation is erroneous."

Veterinary Medicine

108. Epizootology of Atypical Fowl Plague

"Atypical Fowl Plague in Tadzhikistan," by Z. V. Popova, Tr. N.-I. In-ta Zhivotnovodstva i Veterinarii TadzhSSR (Works of the Scientific Research Institute of Animal Husbandry and Veterinary Medicine Tadzhik SSR), No 1, 57, pp 31-42 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 59, Abstract No 80350, by I. V. Kozlyakov)

CPYRGHT

"Noncompliance with the quarantine rules, failure to vaccinate all fowl on threatened farms, and inadequate measures of exterminating Argas persicus ticks facilitated the spread of this disease in 1948-1957. At present, only sporadic cases of atypical fowl plague are seen in the Tadzhik SSR as a result of epizootological studies and careful observation of control measures."

Virology

109. Collecting Influenza Virus in Aerosol Droplet Phase

"The Methodology of Trapping the Influenza Virus in the Droplet Phase of an Aerosol. Report I. The Effectiveness of Trapping the Influenza Virus With the D'yakonov Apparatus and With Soluble Gelatin Foam Filters,": by S. Ya. Gaydamovich, V. V. Vlodavets, and V. R. Obukhova, Institute of Virology imeni D. I. Ivanovskiy and Institute of General and Communal Hygiene imeni A. N. Sysina; Moscow, Voprosy Virusologii, Vol 4, No 4, Jul/Aug 59, pp 396-400

The authors initiate a discussion of their research by pointing out that, heretofore, investigations of this nature have been performed only under experimental conditions in hermetic chambers, where a high concentration of virus can be produced in a small volume of air. Several references to the works of other authors, including Shafir, S. S. Rechmenskiy, V. P. Mitchenko, and A. Ye. Vershigora, are given.

The research described in this article consisted of a comparative study of the trapping capacity of the D'yakonov apparatus and soluble gelatin foam filters with respect to the droplet phase of a virus aerosol. The D'yakonov apparatus is described in detail. Nonsterile gelatin foam filters were used since the solubility of the filters is considerably reduced as a result of sterilization. Type A1 influenza virus, "Pan" strain was

employed as the experimental model. The methodology of the experiments is given. Two tables show a comparative evaluation of the trapping capacity of the gelatin filters and different adsorbents in the D'yakonov apparatus, and the effect of the temperature of the liquid on the effectiveness of the apparatus in trapping an influenza virus aerosol. The following conclusions are presented:

CPYRGHT

"1. A comparative study of the capacity of the D'yakonov apparatus and soluble gelatin foam filters to trap an influenza virus aerosol in the drop-let phase from the air showed that an influenza virus aerosol is most easily detected by this apparatus when sucrose bouillon and a suspension of cutaneous-muscular tissue from chick embryos are used as a trapping fluid, and somewhat less easily when a 10% suspension of chicken erythrocytes or milk are used. The capacity for trapping influenza virus is considerably less in physiological solution and in a mixture of glycerin and physiological solution.

"2. When gelatin foam filters are used, the influenza virus is detected with greater difficulty than with the use of the D'yakonov apparatus. This is largely a result of the inactivation of the influenza virus during the process of dissolving the filters in physiological solution at 37° C.

"3. When gelatin foam filters are dissolved at 37, 22-25, and 4° C, influenza virus is detected in lower concentrations at 22-25° and particularly at 4°, although the filters are not completely dissolved in these cases. The decrease in the temperature of the liquid in the D'yakonov apparatus from 22-25° to 4° slightly affects the effectiveness of virus collection in sucrose bouillon or a 10% suspension of chicken erythrocytes, although a tendency toward higher collection is noted at 4°."

110. Western Equine Encephalitis Studied in Tissue Culture

"A study of the Virus of Western American Equine Encephalomyelitis. Report I: A Comparative Study of Titration and Neutralization of the Virus in Tissue Culture and in Animals," by N. V. Kaverin, Laboratory of Polyseasonal Neuroinfections, Institute of Virology imeni D. I. Ivanovskiy; Moscow, Voprosy Virusologii, Vol 4, No 4, Jul/Aug 59, pp 416-420

The article reports a comparative study of the titration of the virus of Western equine encephalomyelitis in tissue culture and in white mice; the neutralization reaction was also performed in tissue culture and in white mice after intracerebral infection. A virus strain imported from the US in 1946 and subjected to 15 passages in mice was used in the experiments, which are discussed in detail. A suspension of trypsinized chick embryo fibroblasts was used for tissue culture. Tables and graphs show results of the experiments.

CPYRGHT

The following conclusions are presented:

"The tissue culture method is suitable for titrating and neutralizing the Western American equine encephalomyelitis virus

"During titration of the Western equine encephalomyelitis virus in tissue culture and in mice, it was found that the sensitivity of the chick embryo fibroblast culture to this virus does not surpass the sensitivity of mice infected intracerebrally, and does not vary within greater limits than the latter.

"A higher neutralization index was obtained by the neutralizing the cytopathogenic effect in tissue culture than by intracerebral infection of mice."

Miscellaneous

111. Soviet Public Health Described in "Bol'shaya Meditsinskaya Entsiklopediya"

"Public Health" (unsigned article); Moscow, Bol'shaya Meditsinskaya Entsiklopediya, Vol 10, 1959, pp 741-835

A detailed account of Soviet public health has been published in Volume 10 of Bol'shaya Meditsinskaya Entsiklopediya (Great Medical Encyclopedia). The article is divided into six sections: "Introduction," "General History of Public Health," "History of Public Health in Prerevolutionary Russia," "Fundamental Stages in the Development of Public Health in the USSR," "Fundamentals of Soviet Public Health," and "The Organization of Public Health in the USSR." The article also contains a vast bibliography dealing with all facets of public health. No charts, graphs, or statistical tables are presented.

112. Radioelectronics Laboratory Opened in Leningrad

"Laboratory of Radioelectronics" (unsigned article); Moscow, Meditsinskiy Rabotnik, 13 Oct 59

A Laboratory of Radioelectronics and Biophysical Methods of Research (Laboratoriya Radioelektroniki i Biofizicheskikh Metodov Issledovaniya) has been established in Leningrad at the Institute of Experimental Medicine, Academy of Medical Sciences USSR.

The aim of the laboratory is to work out new methods of research for the technical improvement of equipment produced in the experimental shops of the institute. The laboratory will also train specialists in the field of radioelectronics and biophysics.

113. Public Health Network in Moscow

"Perspectives in the Development of the Public Health Network in Moscow for 1959-1965," by N. S. Lapchenko; Moscow, Sovetskoye Zdravookhraneniye, No 4, Apr 59, pp 6-11

Toward the end of 1958, Moscow had 220 hospitals, lying-in-homes, and other hospital-type institutions with a total capacity of 53,200 beds. In addition, there were 156 medical establishments which offered polyclinic service, and 57 medicosanitary units which served the industrial segments of Moscow. Moscow also had 771 health points.

For the next 7 years, an expenditure of one billion rubles will be made to expand public health facilities in Moscow, and the number of beds available in Moscow hospital institutions will reach 65,300.

114. Status of Physicians and Medical Workers of Kirgiz SSR

"Problem of the Medical Cadre in Kirgizia," by Yu. Ye. Danilov; Moscow, Sovetskoye Zdravookhraneniye, No 1, Jan 59, pp 11-16

In the prerevolutionary years, there were only 100 hospital beds and 15 physicians in Kirgizia. In 1957, however, there were 11,200 hospital beds and several thousand physicians and medical workers.

The shortage of physicians in the Kirgiz SSR will be eliminated by 1965 when 2,100 physicians will be graduated by the Kirgiz State Medical Institute. In addition, some 280 pharmacists will be trained during 1959-1965. Some 900 position vacancies are currently available for intermediate medical workers, although there are 8,058 presently employed.

115. Statistical Data on Various Soviet Medical Establishments

"Statistical Material" (unsigned article); Moscow, Sovetskoye Zdravookhraneniye, No 8, Aug 59, pp 59-64

Published statistical tables on the number of individual dispensaries and other nonhospital institutions within the Ministry of Health USSR and the republic ministries give the following figures for 1958 for the USSR as a whole:

Antituberculosis establishments -- 5,562, of which 1,254 are dispensaries

Skin-venereological establishments -- 5,619, of which 615 are dispensaries

Oncological establishments -- 1,498, of which 225 are dispensaries

Medical First Aid Stations -- 1,889

Therapeutic-Physical Culture Dispensaries and dispensary departments -- 1,160

Public Health Points -- of which 7,262 are medical (physician) health points, and 15,596 are fel'dsher health points

Fel'dsher-Obstetrical Points -- 73,993

Kolkhoz Lying-in-Homes -- 11,421

116. Public Health Growth in Kazakh SSR During Next Seven Years

"Perspectives in the Development of Public Health in Kazakh SSR During the Seven-Year Plan of Development for the National Economy," by N. O. Sen'kov; Moscow, Sovetskoye Zdravookhraneniye, No 4, Apr 59, pp 11-18

It is estimated that during the next 7 years the number of hospital beds in the Kazakh SSR will be increased by 25,400, and by 1965 the total number of hospital beds available will reach approximately 93,500 (an average of 11.2 beds per 1,000 population).

Plans have been made for the construction of nine new oblast hospitals, 45 city hospitals, and 60 rayon hospitals. The rayon hospitals will be large enough to contain 50-75 beds.

The number of drug stores by 1965 should reach 1,220. In 1958, the number of drug stores totaled 591. There will be one drug store for every 10,000 persons in the urban areas and one for every 14,500 in the rural areas. A pharmaceutical plant is also planned for this period.

117. Training of Physicians in RSFSR for 1959-1965

"On the Training of Physicians in the RSFSR for the Period 1959-1965," by V. V. Trofimov; Moscow, Klinicheskaya Meditsina, No 1, Jan 59, pp 12-18

During the Seven-Year Plan, the annual number of medical students entering medical institutes in the RSFSR will be between 14,500 and 15,000. By 1965 the number of physicians will be approximately 250,000, which will mean that there will be some 19 physicians for every 10,000 people, or one physician for 526 persons. In 1957, the figures were 15 physicians for every 10,000 people, or one physician for 700 persons. At the beginning of 1958 there were 12,467 vacant positions, of which 5,357 were in rural areas.

The increase in the number of physicians, however, is much less in the Ural area, Siberia, and the Far East. To improve this situation, new medical institutes have been established in the Far East, and the enrollment of medical students has increased in the medical vuzes (higher educational institutions) of the Ural area, Siberia, and the Far East. Two pediatric and five stomatological faculties have been added to these vuzes. To meet the quota of the Seven-Year Plan, RSFSR medical vuzes have taken steps to improve their training methods and to elevate the quality of their instructors.

118. Reorganization of Sochi Institute of Rheumatism

"Reorganization of the Sochi Institute of Rheumatism" (unsigned article); Moscow, Meditsinskiy Rabotnik, 13 Oct 59

The Sochi Scientific Research Institute of Rheumatism has been reorganized into the Institute of Health Resort Studies (Institut Kurortologii). The new institute will study the physicochemical properties of health resort factors and the mechanism of their action on the human organism; develop a method of health resort therapy for various diseases, including rheumatism; and work on the problem of the scientific organization of sanatorium-health resort services.

119. Prof M. A. Mir-Kasimov, Soviet Urologist, Dies

"In Memory of Prof M. A. Mir-Kasimov" (unsigned article); Moscow Urologiya, No 5, Sep/Oct 59, pp 93-94

Prof M. A. Mir-Kasimov, Active Member of the Academy of Sciences Azerbaydzhan SSR, Honored Worker of Science, head of the Chair of Hospital Surgery of the Azerbaydzhan Medical Institute, and an outstanding Soviet urologist, died in his 75th year on 19 July 1958.

Mir-Kasimov graduated from Novorossiysk University in 1913 and until 1924 worked as a physician in a number of hospitals. In 1924 he obtained his Doctor of Medical Sciences degree and was subsequently elected a professor of Azerbaydzhan University. In 1931 he was elected head of the Chair of Hospital Surgery, Azerbaydzhan Medical Institute, and retained that post until his death. He was the author of over 50 scientific works on urology. In addition to his academic post and his pedagogic work, Mir-Kasimov was active in research on surgery pertaining to urology, and was also active in the Azerbaydzhan Society of Urologists.

120. Cybernetics Used in Diagnosis

"Cybernetics and Diagnosis" (unsigned article); Moscow, Tekhnika Molodezhi, No 5, May 59, pp 35-36

The author of this article states that a machine method of diagnosing disorders of some human organs has been invented. It was previously reported that clinical physicians have been testing the effectiveness of an electronic machine in diagnosing eye diseases. Physicians and engineers are now working persistently to develop recording devices which will automatically diagnose heart diseases. Readings that are registered by these devices are subjected to mathematical processing, and real cybernetics follows thereafter. This consists of the construction of valid charts, their conversion with the aid of an electronic machine, and "estimation of a symptom complex" by searching among symptoms of various heart diseases which are stored in the memory of the machine.

We know that the electrocardiomanometer records intracardiac pressure. Sounds emanating from the heart are examined with the aid of electromagnetic and piezocrystalline transmitters which receive acoustic signals from the heart at various points on the body surface and even inside the esophagus. An elektrokymograph, with the aid of which pulsations of the cardiac silhouette, during roentgen translucence, are transformed by the photoelement into electric oscillations, is then used. The multichanneled universal

electrocardiograph is an extremely complicated electronic device: it registers the slightest deviation in the activity of the heart. A physician can collect much objective material concerning the type of activity of a human heart. A physician would have difficulty in figuring out a graphic presentation of the objective material collected.

The machine can decipher the graphic presentation of the material collected. It is careful in classifying an infinite number of the most varied causes that affect heart beats. These causes are comparatively few, but their effect is regular. Other causes are incidental and must therefore be screened. The number of chance deviations, in a large number of repeated observations, to one side or the other is almost the same; when these deviations are combined, they cancel each other out. An objective and careful approach requires statistical analysis. This is the first stage of mathematical processing. "Spectral analysis" of neutralized oscillating processes follows. Every oscillation can be broken down into certain "standard" components. This is called harmonic analysis.

It seems that with the aid of "harmonic curves" it is easier to analyze an infinite number of signals from the heart and easier to formulate the "symptoms complex." It is easier for the time being to formulate these complexes, because the behavior of the heart is more or less known. Although information obtained concerning the functioning of the human brain is also great, it is far from sufficient. The heart is simpler.

Naturally, there might be many different readings; only a logical chart of diagnosis has thus far been developed and a program for an electronic machine has been drawn up. Practical utilization of a diagnostic machine and its wide application is a matter for the near future.

121. Report on Activities of Forensic Medicine Workers

"At the All-Union Scientific Society of Forensic Medicine Workers and Criminologists," by A. F. Rubtsov; Moscow, Sudebno-Meditsinskaya Ekspertiza, Vol 2, No 3, Jul/Sep 59, pp 62-63

A report of the proceedings of a meeting of the Executive Board of the All-Union Scientific Society of Forensic Medicine Workers and Criminologists held on 20 March 1959 is given. Prof V. I. Prozorovskiy, chairman of the board, read a report in which he stated that the society now has 38 branches in 14 union republics, with a total membership of 1,900, including 37 Doctors of Science and 284 Candidates of Science. Most of the branches, he stated, are working efficiently, and hold regular meetings

at which problems bearing on forensic medicine are discussed. There are a number of branches, however, where ideological-political work is unsatisfactory. A presidium which is to improve the guidance of the work of the branches was elected.

122. 1959 Czechoslovak Academy of Sciences Awards Offered

"Prizes Awarded by the Czechoslovak Academy of Sciences in 1959 (unsigned article); Prague, Vestnik Ceskoslovenske Akademie Ved, Vol 68, No 2, May 59, p 240

The journal of the Czechoslovak Academy of Sciences lists the following three projects for which the academy will give awards ranging from 60,000 crowns to 100,000 crowns in 1959.

1. Development of a technically feasible and economical process for the production of germanium from domestic raw materials -- 60,000 crowns.
2. Finding a solution to the problem of rendering harmless radioactive wastes and concentrates produced in the operation of nuclear reactors and by enterprises processing irradiated fuels -- 60,000 crowns.
3. Solving the problem of trapping SO₂ contained in exhaust gases emanating from thermal power plants in a technically feasible manner -- 100,000 crowns.

123. Hungarians Hold International Histology Conference

"International Histology Conference Ends" (unsigned article)
Budapest Magyar Nemzet, 20 Sep. 59, p 5

The International Histology Conference ended on 18 September 1959 with a clarification by Hungarian and foreign researchers on several problems which had, up to now, been described ambiguously in the literature. Two foreign participants, Prof A. Hadzhiolov of the Bulgarian Academy and Prof G. Godina of Turin, told the Hungarian Telegraph Office (the Hungarian news service) of their appreciation for the successful work and modern research of the Histology and Embryology Institute in Budapest.

VIII. METALLURGY

124. Heavy Hydraulic Presses of Prestressed Concrete

"Methods of Decreasing Weight and Dimensions of Heavy Presses,"
by Yu. P. Krzko; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo,
No 8, Aug 59, pp 18-21

Housing, power cylinder, and sectional plunger of the TZhB-150 experimental 50,000-ton hydraulic press are constructed of reinforced concrete partially encased in steel. Designing and testing were conducted jointly by the Division of the Central Design Bureau of Metallurgical Machine Building, Central Scientific Research Institute of Technology and Machine Building, and the Laboratory of Special Constructions of the Scientific Research Institute of Concrete and Reinforced Concrete, Academy of Construction and Architecture USSR. Only 1,350 tons of metal is used in the TZhB-150 press, in contrast to 10,000 tons in US presses of the same capacity. Preliminary drawings have been completed for a 200,000-ton press, designated as TZhB-1200, which will also be of concrete construction.

125. New Mills for Rolling Variable Cross Sections

"Mills for Periodic Rolling" (unsigned article); Moscow,
Promyshlenno-Ekonomicheskaya Gazeta, 14 Oct 59, p 1

A wide assortment of components with variable circular cross sections can be produced on new, three-roller mills developed by engineers Ye. Zhukevich-Stosha, S. Milyutin, and V. Romanchikov of the All-Union Scientific-Research Institute of Metal Working and Machine Building, under the supervision of A. Tselikov, Corresponding Member of the Academy of Sciences USSR. The rolling process is completely mechanized and automatic. Change-over to production of a different product involves only the substitution of the appropriate master pattern. A wide variety of such mills are now being introduced into industry.

126. Alloying Copper and Aluminum With Vanadium

"Investigation of the Effect of Vanadium on the Structure and Properties of Copper and Aluminum," by Ye. M. Savitskiy and J. K. Duysemaliyev; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 7, Jul 59, pp 82-88

Procedures for obtaining alloys of the Cu-V and Al-V systems with varying amounts of V are described, and results are given of mechanical and electrical conductivity tests. Improved mechanical properties (ductility exceeded that of Cu) with little change in electrical conductivity were exhibited by alloys of the Cu-V system containing as little as 0.3-1.00% V as compared to the base metal. Tensile strength was highest (33 kg/mm²) for alloys with 3.29% V, and hardness (H_B = 75 kg/mm²), for those with 1.9% V. Alloys of the Al-V system with V content up to 0.4% showed increased hardness and electrical conductivity but no significant increase in tensile strength.

127. Alloys of Aluminum With Yttrium

"Constitutional Diagram of Alloys of Aluminum With Yttrium," by Ye. M. Savitskiy, V. F. Terekhova, and V. A. Tsikalov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1461-1462

The constitutional diagram of aluminum-yttrium alloys was investigated up to a content of 60% of yttrium by weight. It is concluded on the basis of the results obtained that alloying with yttrium will considerably increase the strength of aluminum alloys.

An investigation of the effect of yttrium on the heat-resistance of aluminum and its alloys is contemplated.

128. Mechanical Characteristics of Metals at Very Low Temperatures

"Investigation of the Mechanical Properties of solids, Particularly Metals, at Temperatures of 4.2° K and Lower; Part 2-- Determinations of the Tensile Strength of Large-Grained Crystalline Aluminum (99.996% Pure) and of the High-Strength Aluminum Alloy B-95," by O. V. Klyavin and A. V. Stepanov, Leningrad Physico-Technical Institute, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 6, Jun 59, 955-959

Results of measuring the tensile and breaking strength of large-grained crystalline aluminum (99.996% pure) and of the high-strength aluminum alloy B-95 at the temperature of 4.2 and 1.6° K are reported. Alloy B-95 was selected as the aluminum alloy which is strongest at room temperature. Its composition is 1.7% of Cu, 2.3% of Mg, 6.0% of Zn, and 90% of Al. It was established in the work described that low temperatures have an effect on alloys which is different from that exerted by them on pure metals: at ordinary ("high") temperatures, alloying elements strengthen the metal, while at low temperatures the pure metal is stronger. It was also established that the tensile strength of a metal is increased at low temperatures, as compared with the corresponding strength at higher temperatures, when defects (dislocations) are present in the metal.

[For additional information on Metallurgy, see also under Chemistry, Nuclear Fuels and Reactor Construction Materials.

Atomic and Molecular Physics

129. Functions of Some Bands of N_2

"Excitation Functions of Some Bands of the Second Positive System of N_2 ," by S. M. Kishko and M. Yu. Kuchinka; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 580-582

A photoelectric study of optical excitation functions of bands $0 \rightarrow 3$, $1 \rightarrow 4$, and $2 \rightarrow 6$ of the second positive system of molecular nitrogen has been carried out. The effect of N_2 pressure on the position of the maximum of the excitation function has been shown. The results were compared with data obtained by other investigators.

130. Matrices of Molecular Vibrations

"On the Relation Between the Kinematic Coefficient Matrix and Inverse Matrices of Kinetic Energies in the Problem Concerning Vibrations in a Molecule," by I. N. Godnev and I.V. Orlova; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 583-588

The application of Lagrange equations with noneliminated holonomic relations to the solution of the problem of molecular vibrations in dependent coordinates is analyzed. Formulas are derived, connecting the matrix of kinematic coefficients A with the matrices T^{-1} and T_0^{-1} , where T and T_0 are matrices of kinetic energy corresponding to dependent and independent coordinates.

131. Profile of the Atomic Beam

"On the Shape of the line Profile in an Atomic Beam," by F. A. Korolev, B. A. Kozlov, and A. I. Odintsov; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 576-579

The theory of the effect of the slit width of the evaporator on the shape of the profile of the spectral line observed in the atomic beam is studied. The general expression is obtained for the distribution of intensity along the profile line. It includes previously known formulas as a particular case.

132. Molecular Vibrations

"Computation of Characteristic Vibrations in Compounds of Phosphorus. Characteristic Vibrations of the Molecules POCl_3 , POBr_3 , PSCl_3 , and PSBr_3 ," by L. S. Mayants, Ye. M. Popov, and M. I. Kabachnik; Leningrad Optika i Spektroskopiya. Vol 6, No 5, May 59, pp 589-593

The frequencies and the form of normal vibrations of molecules of POCl_3 , POBr_3 , PSCl_3 , and PSBr_3 are computed at certain specially chosen values of force coefficients, as well as the sensitivity of all these frequencies to changes in force coefficients, atomic masses, length of bonds, and angles. The problem of characteristics of vibrations corresponding to the so-called P = O- and P = S-frequencies is analyzed.

133. Molecular Vibrations

"Computation and Interpretation of Vibrational Spectra of Tetramethylsilane and Tetramethylsilane- d_{12} ," by I. F. Kovalev; Leningrad, Optika i Spektroskopiya. Vol 6, No 5, May 59, pp 594-599

Methods of Vol'kenshteyn, Yel'yashevich, and Stepanov (Kolebaniya Molekul I [Molecular Vibrations I], GIMTL 1949) and of Mayants (Tr. FIAN SSSR, 5, 65, 1950; DAN SSSR, 89, 423, 1953; and ZhETF, 25, 393, 1953) are applied to computation and analysis of constants of the potential energy (coefficients of force and of effect) and of the forms of normal vibrations of tetramethylsilane. The frequencies of the vibrational spectra of $\text{Si}(\text{CH}_3)_4$ and $\text{Si}(\text{CD}_3)_4$ are computed and interpreted.

134. Absorption Spectrum of a Single Crystal

"Investigation of the Absorption Spectrum of a Single Crystal of 1,2-Benzanthracene in the Region of Lowest Electron Transitions," by M. S. Brodin and M. S. Soskin; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 600-604

The absorption curves of 1,2-benzanthracene at 20 and 290°K (V. L. Broude, V. S. Medvedev, and A. F. Prihot'ko, ZhETF, 21, 655, 1951) in polarized light were obtained for the region of lowest electron transitions. The integral absorption of separate bands and the corresponding polarization ratios were determined. On the basis of comparison of the obtained results with theoretical considerations, the effect of polarization of electron transitions in a molecule is estimated.

135. Infrared Absorption of Chloroform

"Quantitative Investigations of Infrared Absorption and Dispersion of Chloroform," by M. P. Lisitsa and Yu. P. Tayashchenko; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 605-615

Absorption coefficients of liquid CHCl_3 in the spectral range between 470 and $11,500 \text{ cm}^{-1}$ were measured. For fundamental oscillations of certain compounds frequencies and harmonics, the integral absorption and the half-width were computed. Within the range of 250 to 16500 cm^{-1} , the identification of oscillatory frequencies has been carried out. Within the most intensive band corresponding to the fundamental oscillation γ_5 and in the adjacent regions ($460 - 840 \text{ cm}^{-1}$), the dispersion curve has been obtained.

136. Acoustic Double Refraction of Phenyl-Ethyl Alcohol

"Acoustic Double Refraction of Phenyl-Ethyl Alcohol at Low Temperatures," by V. Ye. Eskin and I. A. Baranovskaya; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 616-619

The viscosity and the acoustic double refraction of phenyl-ethyl alcohol were measured at temperatures of -30 to -40°C . The time of orientation relaxation of molecules of this substance is determined. The relaxation time agrees with the same value computed from data on the dynamic double refraction and depolarization of scattered light.

137. Combination Scattering of Nitrogroup

"Influence of Concentration and of the Type of a Solvent on the Intensity of Lines in Combined Scattering of Totally Symmetrical Vibration of the Nitrogroup and on Electron Absorption Spectra of Aromatic Nitro-Compounds," by V. M. Pivovarov and N. D. Ordynseva; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 620-624

The integral intensities of lines of combined scattering of the symmetrical oscillations of the NO_2 group have been measured for a number of aromatic nitro-compounds in relation to the concentration and the type of the solvent. The long-wave absorption bands in electron spectra have been studied for the same substances. Agreement in the character of the measured values has been established.

138. Rotation Isomers

"Energy Difference of Rotation Isomers in Liquid and Gaseous 1,2-Fluorchloro-ethane," by P. A. Bazhulin and L. P. Osipova; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 625-630

Spectra of combination scattering and of infrared absorption of 1,2-fluor-chloro-ethane have been studied. On the basis of comparison of infrared absorption spectra of liquid and crystalline 1,2-fluor-chloroethane, it is concluded that the compound contains rotation isomers. The energy differences of rotation isomers in liquid and gaseous phases have been measured.

139. Absorption Spectra of Carbanions

"Absorption Spectra of Carbanions," by I. V. Astaf'ev and A. I. Shatenshteyn; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 631-636

A systematic study of electron spectra of carbanions, which form through oxidizing ionization fatty aromatic hydrocarbons and their derivatives has been carried out for the first-time. Measurements were made of the spectra of 20 carbanions of the type ArCH_2^- , Ar_2CH^- , Ar_3C^- , and others obtained by action of potassium amide or caustic potash on the corresponding carbohydrates and their derivatives in liquid ammonia. Some laws in the spectra of carbanions were apparent. The spectra of carbanions have been compared with the spectra of carbon ions (carbocations) of analogous structure.

140. Effect of Reabsorption of Luminescence

"Influence of Reabsorption on the Yield and Duration of Luminescence of Molecular Crystals. I," by V. M. Agranovich and Yu. V. Konobeyev; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 648-658

Analysis is carried out of the kinetic equation describing the exciton distribution in a molecular crystal, taking into account the reflection of the luminescent light from the crystal surface. For the case in which the exciton diffusion coefficient is sufficiently small, accurate formulas are obtained determining the quantum yield and the duration of the luminescence of crystals having a shape of plane parallel plates of arbitrary thickness. Formulas for quantum yield permit the computation of the spectral curve of the luminescence of the crystal.

141. Luminescence Decay Time

"Investigation of the Spectral Distribution of the Luminescence Decay Time of Ruby by the Method of the Pulse Taumeter," by N. A. Tolstoy and A. M. Tkachuk, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 659-664

A pulse tau-meter was used for studying the spectral relation of the decay time τ for a number of separate spectral lines of luminescence of crystals of a synthetic ruby with various chromium content. It was established that a ruby may have simultaneously seven or eight different decay times and that the chromium concentration exerts a substantial effect, not only on the absolute value of τ for the individual lines, but also on the behavior of temperature relations of τ in the range of temperatures from 80 to 500° K.

142. Excitation of Phosphorescence and Photoconductivity

"Formal Analysis of the Theory of Two-Step Excitation of Phosphorescence and Photoconductivity. III. Comparison of the Theory with Experiment (Emission of ZnS-Cu)," by N. A. Tolstoy; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 665-671

The theory of two-step excitation, developed in previous works by the author (ZhETF 30, 171, 1956; Opt. i Spektr., 1, 216, 1956; ibid. 5, 590, 1958; and J. Phys. 17, 801, 1956) is compared with experimental data. Assumption on correlations of parameters of the schema, necessary to the agreement of theory and experience, appear to be the same for stationary and relaxational relations in the emission. It is demonstrated that stationary glowing and the initial stages of decay of phosphors of the ZnS-Cu type should be considered as basically "pseudo-monomolecular."

143. Luminophores

"Electroluminophores on the Base of Sulphides and Selenides,"
by O. N. Kazankin, F.M. Pekerman, and L.N. Petoshina; Leningrad,
Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 672-677

Electroluminophores on the base of $ZnS \cdot ZnSe$, activated by Cu, were obtained in a static atmosphere of $H_2S + HCl$. It is permitted the obtaining of bases with a higher content of $ZnSe$ and hence the preparation of more efficient electroluminophores with emission in the long-wave region of the spectrum.

The investigation of the relation of brightness of this class of electroluminophores to voltage, frequency, and temperature revealed certain peculiarities which may be explained on the basis of the decrease in depth of capture levels with the Se admixture.

144. Metallic Coatings to Reduce Reflection

"Reduction of Reflection of Metallic Coatings," by I. N. Shklyarevskiy and A. A. Avdeyenko; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 678-684

A method is suggested for reducing the reflection of coatings of aluminum and silver from the glass side in the range of $0.6 - 1.1 \mu$. It is shown that the transparency of treated coatings in this range is at least twice as great as for the same untreated coatings. If the transparency of the reflective coating is such that the wave reflected at the metal-glass boundary does not make any considerable contribution to reflection coefficient on the air side, then an increase of transparency is achieved on account of a decrease in absorption. The treated coatings may be used for Fabry-Perot interferometers and others. By treating the interferometer coatings, the interference lines are inverted. Their intensity is higher than the intensity of those lines inverted by cutting the "zero" ray. The treatment makes it possible to use reflection interferometers with an opaque second coating for the study of the superfine structure of lines.

145. Photographic Sensitivity to X-rays

"Determination of the Absolute Sensitivity of Some Photographic Materials to Ultrasoft X-Radiation," by A. P. Lukirskiy and I. A. Karpovich; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 685-687

The blackening curves for some photoemulsions under action of ultrasoft X-rays of wave length of 23.6, 44, 67, and 113 Å were obtained. The absolute sensitivity of the materials under investigation was established.

146. Lamps for Spectrophotometers

"On Hydrogen and Mercury-Helium Lamps for SF-4 Spectrophotometers"; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 688-691

The construction and the electrical, spectral, and other characteristics of the hydrogen VSFU-3 and of the mercury-helium RSFU-2 lamps are described. The lamps are applied in SF-4 spectrophotometers. Information on their practical operation is given.

147. Zeeman Effect in Fluorescence

"Influence of a Magnetic Field on Lines of the Blue Fluorescence and on Absorption Lines of Some Crystals of Pure Cadmium Sulfide at 4.2° K," by Ye. F. Gross, E. Grillot, B. P. Zakharchenya, and M. Bance-Grillot; Leningrad, Optika i Spektroskopiya, Vol 6, No 5, May 59, pp 710-712

The effect of a strong magnetic field on fluorescence lines and absorption lines has been studied in the Physicotechnical Institute of the Academy of Sciences USSR in Leningrad. It was found that at a temperature of 4.2° K, the fluorescence of CdS, obtained by sublimation at high temperature gradient, exhibits a Zeeman splitting of lines into doublets.

148. Polarization of Fluorescence

"Limit of Fluorescence Polarization," by A. N. Sevchenko, G. I. Gurinovich, and A. M. Sarzhevskiy, Institute of Physics and Mathematics, Academy of Sciences Belorussian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 5, Jun 59, pp 979-982

The relation of polarization degree to frequency of the exciting light in the range of the long-wave absorption band and emission may be explained by different orientation of dipole moments of direct and inverse transitions. The schematic of A. Jablonski (Acta Phys. Pol., 10, 33, 1950), explaining the difference in values of the limits of polarizations of various substances under usual experimental conditions, is given experimental confirmation. The transition with emission and absorption between the same pair of levels is anisotropic and may be modeled by a linear oscillator.

Nuclear Physics

149. K-Meson

"Properties of the K-Meson," by Ya. I. Granovskiy; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 6, Apr 59, pp 1225-1226

Equations are derived from the corresponding Lagrangian and used to determine the spin and parity of the K-meson.

150. Polish Cyclotron

"The First 'Large' Cyclotron in Poland," by Prof Dr Henryk Niewodniczanski, Corresponding Member of the Polish Academy of Sciences (PAN) and Head of the Institute of Nuclear Physics (IBJ) in Cracow, and Jerzy Zakrzewski, Head of the Division for Operation of the Large Cyclotron of the Institute of Nuclear Physics (IBJ) in Cracow; Warsaw, Problemy, No 2, 1959, pp 146-149

On 22 November 1958, the "large" cyclotron of the Institute of Nuclear Research was set into operation. The celebration was attended by high-ranking government and party officials, ministries, deputy ministries, heads of educational institutions, envoys to the Sejm, representatives of Polish science, led by Professors L. Infeld, Z. Klemensiewicz, A. Krupkowski, A. Krzyzanowski, M. Miesowicz, P. Nowacki, A. Soltan, and S. Szczeniowski, and Soviet representatives.

This cyclotron is called "large" in order to distinguish it from a smaller, 5-Mev one, installed in 1956.

The builders of the large cyclotron were: Commercial Construction Union, Foundry imeni Lenin, Administration of Construction and Assembly No 2, and several subcontractors.

The dimensions of the housing are as follows: 54.5 x 34.5 meters, 22,570 m³, and 3,100 m² surface.

Characteristic Data of the Cyclotron:

Deuteron energy	12.5 Mev
α - particles energy	25 Mev
Diameter of pole shoes	1200 mm
Height of slit between pole shoes	345 mm
Total mass of iron core of electromagnet	120 tons
Winding power of electromagnet of magnetic field of 15 kOe strength	100 kw
Stabilization of magnetic field	$\pm 0.03\%$
Power of high frequency generator	120 kw
Frequency of resonance cycle	13.6 - 10 Mc
Frequency stabilization	$\pm 0.01\%$
Potential amplitude between dees	150 kv
Inner height of dees	170 mm
Effective boundary radius of accelerated particle trajectory	520 mm
Deflector voltage	60 kv
Ion current on internal target in accelerating chamber	1 ma

The coolant is distilled water in the first cooling loop. The second cooling loop is of ordinary water, passing through a sprinkling tank.

151. Determining Date of Nuclear Explosions on Basis of Precipitations

"On Determining the Dates of Nuclear Explosions Through Measurements of the Radioactivity of Atmospheric Precipitations," by R. Tomaszenko, Aerology Laboratory, State Hydrological and Meteorological Institute, Legionowo; Warsaw, Acta Geophysica Polonica, Vol 7, No 1, 1959, pp 55-63

This article discusses the numerical and graphical determination of the date of a nuclear explosion on the basis of measurements of two cases of atmospheric precipitation. The importance of the dependence of a power exponent k on the time elapsed since the collection of the precipitation is emphasized. The results obtained are tabulated and illustrated by graphs. They indicate the possibility of using the graphical method ($k = 1.0$) for determining the nuclear explosion date approximately 20 days after the collection of the precipitation. This method, however, applies only to the case in which there is a distinct increase of radioactivity resulting from a single nuclear explosion.

Theoretical Physics

152. Wave Function of Many Particles

"Equation for a Wave Function of a System of N Particles in the Problem of Many Bodies," by V. G. Solov'yev, Joint Institute for Nuclear Research; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 4, Jun 59, pp 755-758

N. N. Bogolyubov (DAN, 119, 244, 1958) suggested a new variational principle which is a generalization of V. A. Fok's method (Zs. f. Phys., 61, 126, 1930). Bogolyubov's method (Usp. fiz. nauk, 67, No 4, 1959) facilitates taking into account, not only two particles, but also arbitrary number. This method is applied to the derivation of an equation for a wave function of a system of N particles in the problem of many bodies. The method is particularly valuable for processes in which correlations of many particles play a dominant role.

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X. MISCELLANEOUS

153. Councils for the Coordination of Complex Scientific Research
Formed in Academy of Sciences Ukrainian SSR

"Councils for the Coordination of Complex Scientific Research"
(unsigned article); Moscow, Promyshlenno-Ekonomicheskaya
Gazeta, 12 Aug 59

To eliminate duplication in fulfilling important projects for the national economy, the Presidium of the Academy of Sciences Ukrainian SSR has formed a number of Councils for the Coordination of Complex Scientific Research (Soviet po Koordintsii Kompleksnykh Nauchnykh Issledovaniy). These councils have been formed to cope with the following problems: utilization of atomic energy, radiophysics, radio engineering and electronics, scientific fundamentals of the automation of production processes, astronomy and astrophysics, and others. The councils are to determine the thematics and establish contacts with vuzes, branch research institutions, sovnarkhozes, ministries, and departments.

The Institute of Electric Welding imeni Ye. O. Paton, Academy of Sciences Ukrainian SSR, handles the coordination of scientific research in the country on the problem "Electric Welding Processes, Their Mechanization and Automation." A Council for the Coordination of Complex Scientific Research, which has a staff of 59 top welding specialists, has been established within the institute. This council checks the status of work on the introduction of new welding technique, investigates, and recommends new types of electric welding equipment to industry, assists sovnarkhozes in the utilization of new welding techniques, and conducts coordination conferences.

Now, there are more than 50 various councils and commissions within the Academy of Sciences Ukrainian SSR which coordinate scientific research on the most important scientific problems.

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